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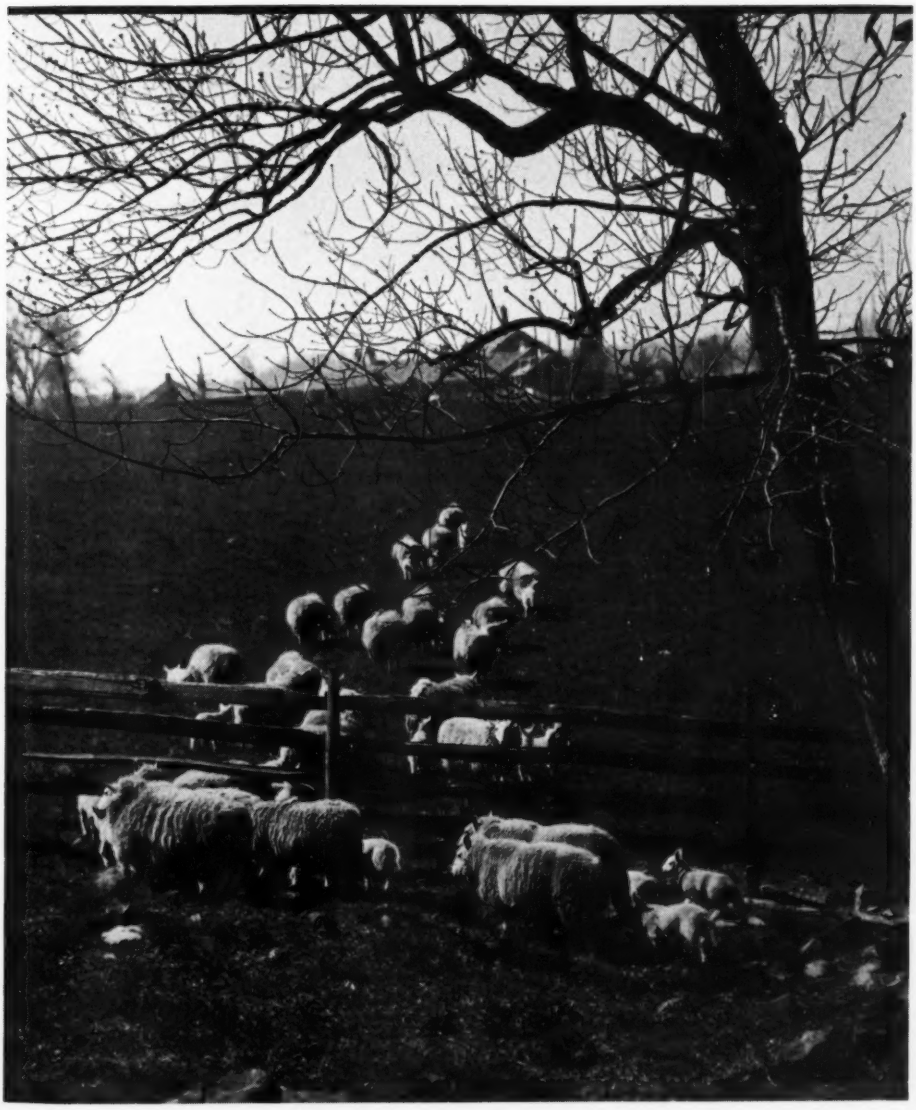

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INVESTMENT BUILDING **WASHINGTON, D. C.**

Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: Investment Bldg., Washington, D. C.

VOLUME XXIII NUMBER THREE

TABLE OF CONTENTS, MARCH 1939

The Ides of March 3
It's Time to Turn to the Soil, Says Jeff

Problems of Feeding Cigarleaf Tobacco 6
D. E. Haley Discusses Them

Borax for Alfalfa in Northern Idaho 9
Recent Findings by W. E. Colwell and G. O. Baker

Research Replenishes Florida's Sugar Bowl 12
J. F. Cooper Tells of Its Comeback

Use Good Soil for Hybrid Corn 14
Is the Recommendation of A. L. Lang

The Importance of Potash to Southern Agriculture 18
G. B. Killinger Discusses the Evidence

Grandfather Rothamsted 20
F. S. Prince Visits the Oldest Experiment Station

Editorials 27

Reviews 29

Foreign Agriculture 35

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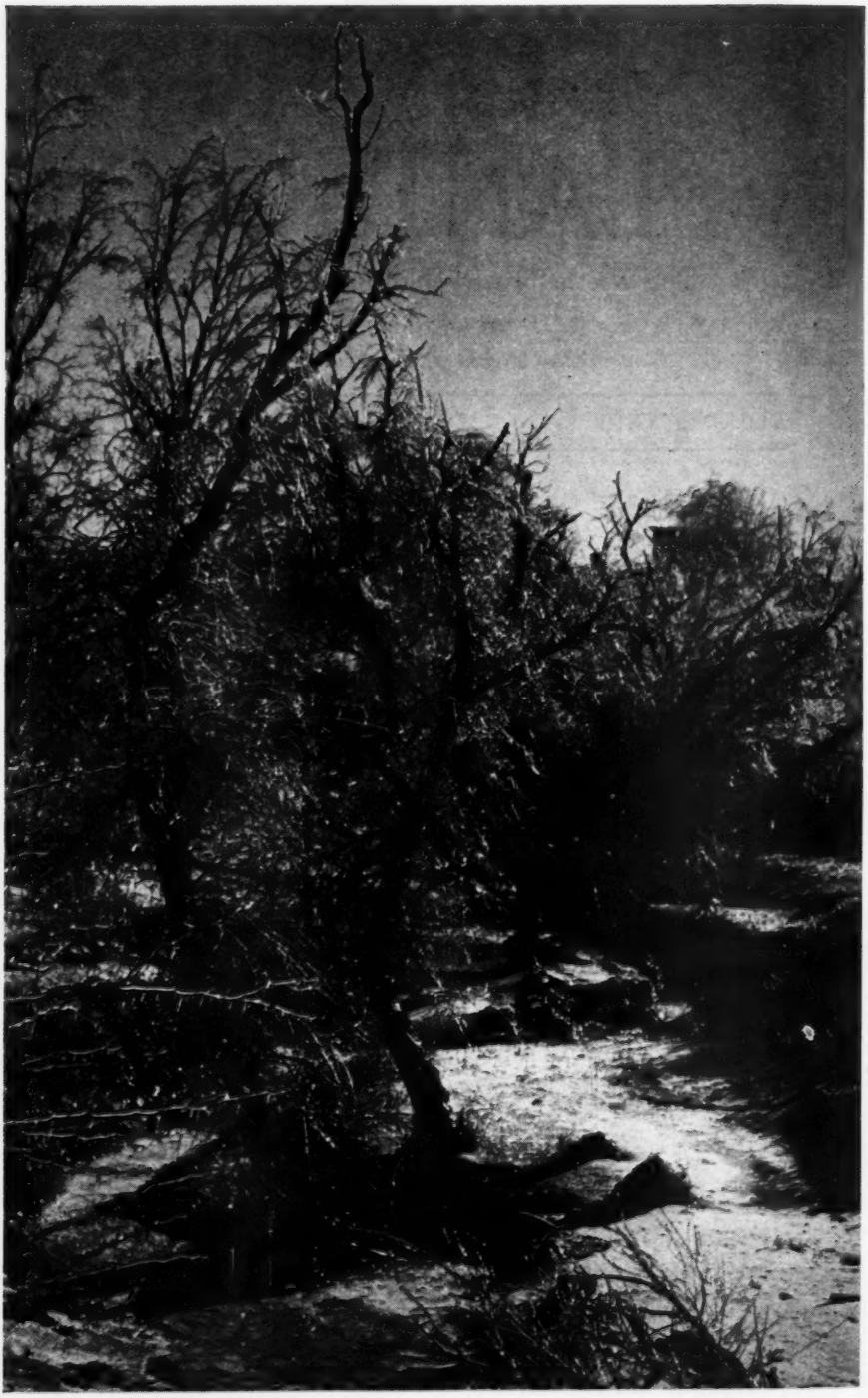

UNTIL SPRING MAKES UP HER MIND, LOOK OUT FOR THE "HALF & HALF" STORM.

Better Crops with PLANT FOOD

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VOL. XXIII WASHINGTON, D. C., MARCH 1939 No. 3

The earth stirs and ambition soars on—

The Ides of March

By Jeff McDermid

ACCORDING to my high-school Caesar, the Ides of March were something to beware of in the annals of the Ancients—a portent of trouble and a sign of disaster. Likewise, in one of Dickens' Tales, I think it was Barnaby Rudge, there was considerable local animosity in the taprooms of wayside inns toward certain days of middle March, in which a raven creaked a dismal warning.

However, up our way, we look forward toward March 21 with hopes renewed; and the chief difficulty, aside from low prices and some tariff grumbling, lies in muddy roads, swampy fields, and occasional floods, together with a few rheumatic twinges and pangs of recurrent spring fever. In other words, winter lingers on the threshold of spring without her galoshes on, and tracks up the floor considerably.

March is undoubtedly the index and the preface both to any ordinary agricultural year. Instead of fearing the Ides of March, we might well ponder the Ideas of March and make more headway against our obstacles. One stands around the house while the soil is frozen and makes a few casual plans against the coming seed time, but with the first freshet and the return of the robin, sudden zeal comes to the surface, full bent upon purposeful performance.

Not that this is as easily done as said,

far from it. One gets "azoturia" as knowing horsemen call it, from comparative idleness and softened muscles. Age creeps on apace each winter, and the spring shakes the fact into us that we are not as chipper as of yore.

I recall how my Father clung to a few acres after us youngsters left home; and when the March zephyrs began to loosen the ice sheets, he would sally forth to crack up some stump or stretch a loose fence wire. Luckily we had a kind and watchful neighbor handy, a great, giantlike native New Yorker who liked to gossip over the winter embers with Father about old times way down East.

HE would observe my sire advancing across the clumpy meadows in March, with fire in his eye and feebleness in his frame. This friend would start out after Father and wait until he was pretty well tuckered out in his tinkering, whereupon he would shout, "You need a hired man to do that job! Guess I'm elected 'cause I need the exercise." Gently he would take the tools away from Father and finish the job himself, making a huge fuss and grunting over it as though it were a real herculean task. He never asked for pay for two reasons—it was voluntary on his part and Father was Scotch! He knew that when the sun got too hot Father would have sense enough to stay in the shade, but that the real danger zone for men of big ambition and failing strength lay in the Ides of March. March is the month of big ambitions, but not all of us have strength of will or body to carry us through our glorious hopes to harvest time.

Changing times alter the situation respecting the mental processes of the farmer as the dormant season ends. In our boyhood days, and even since to some extent, the average farmer confined his thinking within the fence lines of his forty. What he might do himself unaided, save in neighborly exchanges, comprised the scope and vision of his plans.

It was the era of self-reliance, bred in the hearts and hopes of westward pioneers, a legacy to the courage of migrating sons of free-born farmers. In North and South 'twas much the same, albeit some differences existed in the labor supply and seasonal circumstances.

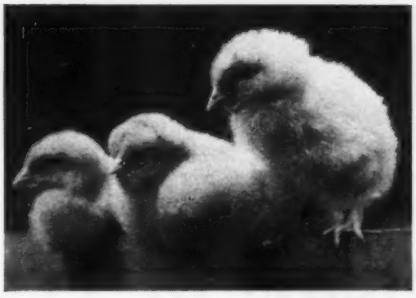
Physical barriers and mechanical problems occupied their minds in March. These tangible obstacles related to home-making, acre-tilling, and market-reaching. Mind and muscle, trained and attune, might solve them in time, barring sickness and natural hazards. The whole western world was expanding and broadening, new consumers were on the seas enroute to our shores where railways, skyscrapers, tunnels, canals, and border cities gave promise of constant employment.

Thus the nature of the age itself and the period in which they lived and farmed shaped the extent and direction of their March endeavors. And so while they were indeed brave and accomplished pioneers, we find our present farmers no less a race of discoverers and planners, but faced with risks and doubts, handicaps and hazards—with one distinct and lasting advantage on our side, that of applied science. This science, it is true, consists of things physical and mechanical more than it does in the twilight zone of economic improvement and solution. Yet not all our physical and ordinary wants are satisfied, for we do not have the degree of home comforts, soil betterment, and market satisfaction commensurate with the sacrifice our fathers made.

DESPITE the fact that farmers have learned to plan and work together more successfully in the wake of economic turmoil, it remains a basic fact that personal planning and farm management details must still occupy the leading part in the drama of agriculture. We may meet at the school house or the town hall for marketing discussions, grange sessions, and conservation elections, but it is the individual application of accepted standards that measures our general progress.

There is bound to be some wasted ef-

fort on the part of agricultural leaders who are too intent upon getting localized, provincial-minded folk to see the picture in the frame of a huge international canvas. Local meetings which lead off with tiresome statistics and rather academic, almost theoretical, but round-about approaches to the home farm's place in the planetary system are not wholly effective. I agree that we must not be nationally or regionally selfish and narrow, that our gaze must be upon the world at large and the future generations, and that the pitiful urban consumer bereft of decent balanced rations is surely worth as much as the cross-bred shote or the pedigreed cow, or what these critters consume. But let's not get dizzy about it. Dealing in administrative problems is one thing and facing farmers is another, and sometimes the two forces get sadly jumbled.



FUNDAMENTALLY, it is always wise for an industry to know where it is going and why. But the industry of agriculture is made up of countless atoms of humanity which are not all alike able to digest and assimilate all the dogmas and doctrines animating the mass as a whole. The amount of progress we make in the direction of our national goals must depend upon the degree with which our local leaders succeed in enabling individual participants in the program to contribute to those goals in their own practical ways.

One of our northern State extension services, it seems to me, has nailed these principles to their mast head. It has been their objective to reach national goals through well-timed messages to farmers, couched in everyday, personal language. If they can make the average hard-pressed farmer reason out for himself that his best interests lie in an active participation in conservation programs, for instance, half the battle is won. Luckily, they omit tariffs, sacred duties to consumers, and promotion of exports, and settle down on terms that every mortgaged man can understand.

Moreover, it has been a sensible rule for years to avoid argumentative points when selling anything. Hence, for us to begin talking to a bunch of dairymen about our duty to promote world trade and industrial development, when they are apt to be thinking to themselves about 12-cent cheese and reciprocal treaties—it's a weak approach to a soil improvement program. I do not pause to settle this issue here as to dairy imports. It simply persists as a sort of blind prejudice in mass minds in the milk belt, and he who offends in that regard is dragging in a dead cat for nothing.

WE all learn by experience, so let's note how this certain extension staff has found out a better way to reach the farmer. The first thing they do is leave all their world charts and "sacred obligations" back on the library shelf. The next thing they do is consult the soil reconnaissance maps of the State and the test plot yields. This data and the county agent's own field books provide more thunder than "international repercussions." If a guy doesn't appreciate what his own homestead needs, then he isn't worth saving anyhow. Thus armed, the procedure is to show how the agricultural conservation program aids the repair of soils and the replenishment of the purse. Open-minded chaps usually wonder why somebody didn't tell it to them that way before. Here's a sketch of the method:

Last autumn the precinct committeemen collected soil samples from each

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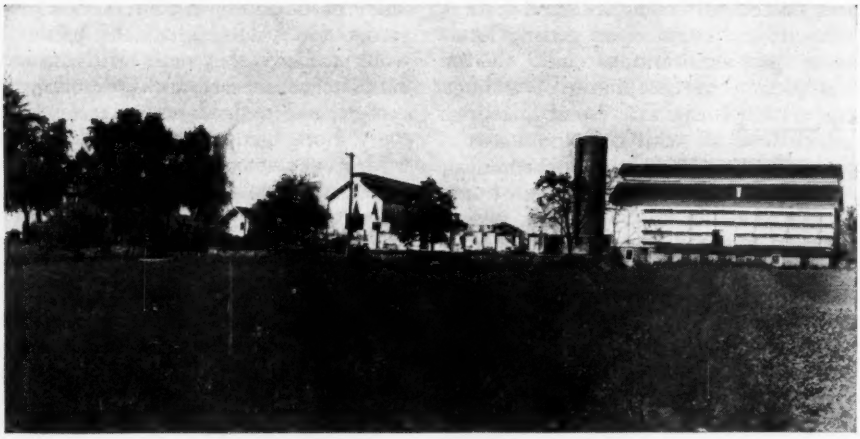


This is typical of the fine buildings in the main tobacco districts of Lancaster County, Pennsylvania.

Problems of Feeding Cigarleaf Tobacco

By D. E. Haley

Pennsylvania State College of Agriculture, State College, Pennsylvania

THE problems involved in the production of cigarleaf tobacco in Lancaster County, the center of the tobacco industry of Pennsylvania, are many and varied. Those who are primarily interested in fundamental studies pertaining to this particular crop fully realize that any recommendations they may care to make, and especially those which involve a marked change in the agricultural practices commonly employed in the handling of this crop, must be made in the direct interest of the grower, the manufacturer, and the consumer.

The average tobacco grower of this locality produces his tobacco on soils which for the most part have been under cultivation for 200 years. In certain instances he has changed his practices as a matter of convenience. At other times he has accepted certain recommendations from State and Federal representatives which have been based on sufficient experimental evidence. In large measure, however, the methods he employs in producing tobacco are based primarily on personal experience and observations. He is open-minded, however, and will make certain fundamental changes if he fully realizes that it is to his interest to do so. In this he is aided materially by the advice of the local County Agent, Floyd S. Bucher, an experienced tobacco grower himself and one who is in close touch with those engaged in tobacco research.

The consumer demands among other things a cigar that burns well and which appeals to him from the standpoint of taste and aroma. The manu-

facturers have endeavored to standardize their product to meet with the approval of the consumer and with a remarkable degree of success, when it is considered that the tobacco they use may have been produced under widely different environmental conditions. However, the quality of their final product is closely associated with the quality of the original leaf itself.

Use of Nitrogen and Potash

The inherent qualities of the leaf, sought for by the manufacturer and consumer, depend primarily upon the way it has been handled on the farm. The problems relating to production, therefore, become of paramount importance. These involve, among many other things, the rational use of nitrogen and potash as fertilizing materials.

No attempt is made to minimize the importance of nitrogen in the nutrition of cigarleaf tobacco. An attempt is made, however, to call attention to the possible danger of adding an excess and to stress the importance of ready availability.

Nitrogen is absorbed and utilized normally by the growing plant in the early stages of growth, provided that it is supplied in a readily available form. After the plant is "topped" the absorption and utilization of nitrogen appear to be more harmful than beneficial. A marked absorption of nitrogen at this stage lowers the resistance and increases the susceptibility of the leaf to invasion by certain disease organisms. This condition is not so apparent if the rainfall is at a minimum during this period. Heavy rainfall, however, will greatly aggravate this condition.

Nitrogen is absorbed more readily than is potash under normal conditions. Moreover, excessive quantities of available nitrogen tend to depress the absorption of potash, a point which should be considered where quality production is involved.

Contrary to popular belief, Pennsylvania cigarleaf tobacco is not a high nitrogen tobacco. A concentration of 3.5% in the mature leaf will suffice if the concentration of potash is in excess of this figure.

Stable forms of nitrogen such as proteins contribute to certain qualities within the leaf itself. These compounds are not broken down during fermentation, and a relatively high concentration of proteins is not necessarily conducive to a good smoke. Simpler nitrogen compounds must be

A good field of cigarleaf tobacco in Lancaster County, Pennsylvania

Potash irons out the leaf, giving it a smooth surface and improved texture. Left was fertilized with 1,000 lb. of complete fertilizer containing 16% potash; center with 1,000 lb. carrying 4% potash; right, no fertilizer.

broken down and dissipated before the product is placed on the market. A high concentration of these may even prevent a satisfactory fermentation.

It is quite apparent, therefore, that considerable attention should be given to the kind and quantity of nitrogen to apply. If a grower chooses to use 30 lbs. of nitrogen per acre, it is thought at the present time that 20 lbs. should be in a readily available form such as nitrate. On the other hand, 10 lbs. of the nitrogen should be in the form of cottonseed meal or its equivalent. This is to guard against adverse weather conditions, but excessive quantities of cottonseed meal must be avoided as the nitrogen is not in a readily available form and the chances appear good that more nitrogen will be made available through decomposition in the later rather than in the earlier stages of growth, which may be more harmful than beneficial.

Owing to the fact that these soils have been under cultivation for so long a period of time, it is quite possible and very probable that the concentration of certain elements necessary for the growth of tobacco has been reduced to a minimum. Among these may be mentioned manganese, boron, zinc, and a number of others of the less common elements. It is apparent, therefore, that a maximum development of a root system is necessary to insure an extensive feeding area which will tend to insure the absorption of the necessary quantities of these elements. This holds true likewise for potash, as the total absorption of this material appears to be closely associated with the extent of root development.

The grower has realized that a good physical condition of his soil is necessary for cultivation, aeration, and root development. In order to accomplish this purpose, and to obtain the maximum benefits of a fertilizer application, some growers have resorted to the use of well-rotted manure. This practice is to be highly recommended as here is found a quantity of elements,

(*Turn to page* 38)

Borax for Alfalfa In Northern Idaho

By W. E. Colwell and G. O. Baker

Idaho Agricultural Experiment Station, Moscow, Idaho

IT IS confusing indeed to understand why one should apply borax on one plot of ground to destroy plant growth (weeds) and on another to improve plant growth. This perplexing problem is now confronting many farmers of northern Idaho who are using heavy applications of borax as a measure for weed control and are applying very light applications to alfalfa, which is showing a certain type of yellowing, in order to improve the yields and quality of that hay. The type of disturbance referred to is one in which the leaves turn light green to yellowish. Sometimes the leaves take on a reddish color, and in fact the same leaf may exhibit variations of both colors. In severe cases the growing points are affected so that the new leaves are quite yellow and remain small in size until growth at the tip practically stops. Plants affected in this manner are characteristically stunted and are generally shorter than the healthy plants.

The cause of this disturbance has been known only in recent years. In 1936, workers in British Columbia were trying out several chemicals in an attempt to overcome certain diseases of apples called "drought spot" and "corky core." It so happened that in many of these orchards yellowed alfalfa was growing under the trees. This proved to be a fortunate situation, for it was observed that the color and

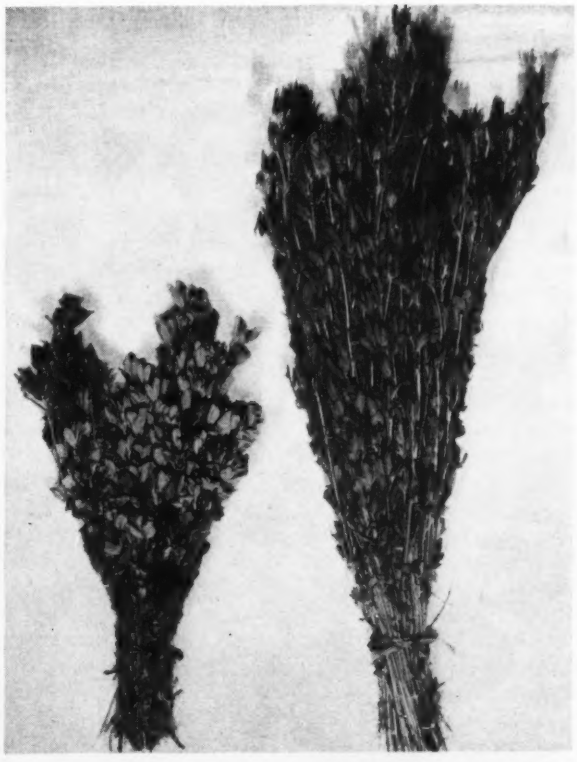


Fig. 1—The above-ground parts of individual alfalfa plants grown on a coarse sandy loam soil. The plant at the left came from the check plat receiving no borax, and the one at the right from the plat receiving borax at the rate of 60 pounds per acre (fall application). Note the yellowed leaves in the plant at the left.

vigor of those plants growing where borax or boric acid was placed under a tree were markedly improved. This led to additional investigations to see whether or not boron additions would really improve the alfalfa crop. It was found that the addition of either borax or boric acid in small amounts brought about a recovery. Three pounds of borax will supply as much boron as is contained in two pounds of boric acid; borax, however, is usually the cheaper of the two sources of boron.

Tests Reveal Plant Needs

Observations of yellowed alfalfa fields in northern Idaho indicated that a similar deficiency of boron might be found there, and so several field plats were established in that area. Two tests, one on a coarse sandy loam and the other on a silt loam, were designed to compare fall with spring applications and also to obtain some information regarding the best rates of application. In each case, one-twentieth acre plats received 20, 40, and 60 pounds of borax per acre in November 1937 and in April 1938. In addition to these, 10 other tests on alfalfa were made in various localities by applying 40 pounds of borax per acre in the spring of 1938. The material was mixed with dry sand and broadcast.

Observations made in June 1938 just before the first cutting indicated that the fall applications were more effective than the spring treatments; also that, in case of the coarser textured soil, the 20-pound application in the fall or in the spring was insufficient. All plats receiving 60 pounds showed no yellowing. In three of the 10 spring tests the 40-pound application produced only slight beneficial results, and in the rest the response was quite marked.

Fig. 2—Sunflower plants 40 days old growing in a gravelly loam soil, to which all the essential elements except boron were supplied. Note the dead center of each of the five plants and the drooping of the older top leaves.

So great was the improvement caused by the 40- and 60-pound applications that in several of the plats the boundaries were noticeable from the roadside, and many interested passers-by stopped to inquire about the strange sight.

The increased growth and the absence of yellowing resulting from the addition of borax to alfalfa is shown in figure 1. The plant from the check plat was very yellow, and the blossom buds were aborted or very small and deformed. On the other hand, the plant from the treated plat was dark green in color, and the blossom buds were large and normal. No compe-

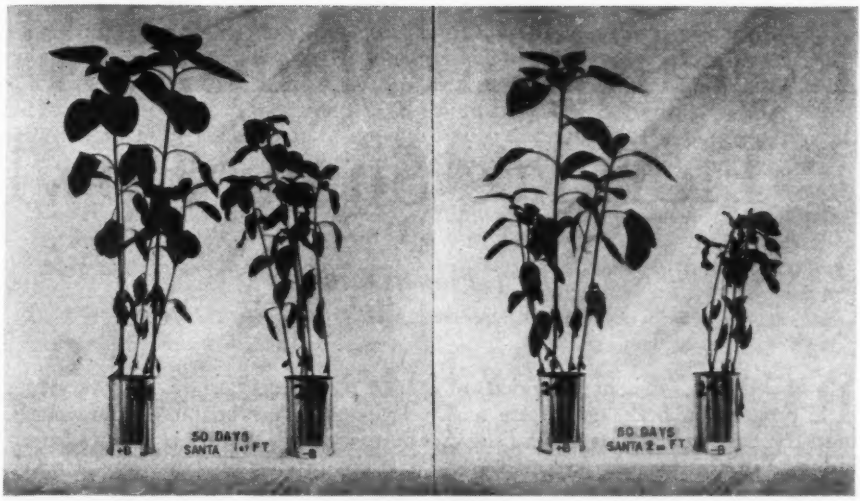


Fig. 3—Sunflowers growing in a first and a second foot sample of uncultivated Santa silt loam. From left to right, the first and third cans received boron. Note that there is a bigger difference in the second foot pair.

tition existed between the untreated plant and other plants in a radius of 3 feet, while the one treated with 60 pounds of borax per acre had three plants within a one-foot radius. This shows that the untreated plant did not have as much competition as the treated one, and that a lack of available boron was apparently the cause of its yellowed and stunted growth.

Increased Yield and Quality

One cooperator reports that his livestock will eat the green, healthy alfalfa before they will the yellowed plants, and even claims his milk production was decreased whenever his cows were forced to feed on hay made of boron-deficient plants. He believes that an investment of $1.20 per acre for 40 pounds of borax to apply in the fall is one of the most economical ways to increase the tonnage and quality of his alfalfa, and is adding this fertilizer to his alfalfa fields.

Analyses of a limited number of alfalfa samples seem to indicate that the protein content of boron-deficient alfalfa is somewhat less than that of healthy plants receiving sufficient boron for normal growth. If further work substantiates these findings, it would help to explain why the feeding value of the yellowed plants is lowered and would confirm the farmer's observations referred to above.

The field tests have furnished valuable information regarding the existence of boron deficiency in northern Idaho, but are both time-consuming and costly. It was desired, therefore, to develop a greenhouse method of testing soils from various parts of the State to see whether or not they contained an ample supply of boron. Consequently, soil samples were collected from fields where there was a question about the boron supply, and these were used in greenhouse studies. Five sunflower plants were grown in one-pound samples of the soil to be tested, and all the necessary plant foods except boron were added to the soil in the form of a nutrient solution. The boron must then be supplied by the soil itself, and the resultant growth of the plants should indicate whether or not there was enough boron in the soil for normal growth. The containers in which the plants were grown were ordinary, new, No. 1 "tin cans." Sunflowers

(*Turn to page* 37)

Research Replenishes Florida's Sugar Bowl

By J. Francis Cooper

Florida Agricultural Experiment Station, Gainesville, Florida

RESEARCH, the handmaiden of progress in both agriculture and industry, has enabled a struggling sugar industry in the Florida Everglades to emerge from bankruptcy to a paying basis, held in check now only by quota restrictions. Better varieties of sugarcane, heavy yielders maturing at proper times and resisting pest attacks, have been developed by plant breeders and have literally "saved the day" for the Everglades sugar industry.

Ruins of Spanish and Mission sugar houses still to be seen in northeastern Florida are evidence of the fact that early Spanish settlers attempted sugar production in Florida. Although cane has been grown for sirup continuously in the State, the reasons for sugar failures are clothed in obscurity.

Of more recent origin, the Everglades development can be traced from records, however, and its story is a saga of overcoming production handicaps through experimentation—a success story written in thousands of acres of fertile muck soils now growing sugarcane and giving support to about 5,000 families of laborers and other employees. The swamp is blossoming and bringing forth a sweet harvest.

When the Federal government ceded the Everglades to Florida under terms of the Swamp and Overflow Lands Act of 1850, the State became obligated to improve and develop the area. About 1905 it set about a program of draining this 3,000,000 acres of flat saw-grass plains surrounding Lake Okeechobee, where for hundreds of years dense saw-

Cultivating young sugarcane in the Everglades section of Florida.

grass had grown, partially decayed, fallen back into the water, and thus prevented from continued oxidation had built up a deposit of peat ranging from one to several feet deep over the entire area. Drainage canals were dug to lower the water level, and early in the 1920's farmers began to take over portions of the Everglades.

Planned Sugar Development

Since sugarcane is a tropical plant, dreams of an immense sugar bowl again haunted those interested in developing Florida. Very early attempts to grow sugarcane were made at Moore Haven and Hialeah. In 1923 F. E. Bryant transported on flat-bottom barges, through one of the recently-completed drainage canals which connected Lake Okeechobee with the Atlantic ocean, equipment for grinding about 750 tons of cane a day. The outfit was set up at Canal Point, where the United States Department of Agriculture established a sugarcane research laboratory. The sugar house formerly at Hialeah was moved to Clewiston in 1928 and began operations, with the Canal Point plant later being coordinated with it.

In the spring of 1930 the company went into bankruptcy, and it seemed that this effort at sugar production in Florida was to meet the fate of earlier endeavors along the same line. A new company took over the operations in December 1931, however, and is now producing the universal sweet at costs lower than any other continental area, Hawaii, or Puerto Rico, about equal to the costs in the Philippines, and only slightly higher than those in Cuba. While efficient management naturally has played its part, research is largely the thing which has made this possible.

A branch of the Florida Experiment Station was established in the Everglades at Belle Glade in 1923. In September 1930 it employed Dr. B. A. Bourne, a scientist formerly with the bankrupt sugar company and prior to that with the United States Department of Agriculture. The company permitted use of test plots on its lands, and a successful cane-breeding program went forward.

The Everglades has a long growing season and experiences only occasional frosts. Sugarcane will bloom there, and thus it is possible to make crosses in an effort to develop better strains and varieties. In the winter of 1930 Dr. Bourne made 2,717 crosses and self-seedings, from which he selected 92 canes to be carried forward in line tests. In 1931 more than 100,000 new seedlings were

(*Turn to page* 45)

The harvest season for sugarcane has been extended from 4 to 8 months.

Use Good Soil For Hybrid Corn

By A. L. Lang

Illinois Agricultural Experiment Station, Urbana, Illinois

NEW emphasis has been given to the value of good soil and to the need for better systems of soil management by recent development and widespread use of hybrid corn. Inherent high-yielding capacity of the more desirable hybrids has not been expressed to the fullest extent on soils relatively low in productivity. By comparing hybrids with open-pollinated varieties of corn on soils varying in productivity and under different systems of soil management it has been found that some of the better hybrids are more responsive to good soil and good soil management practices and more sensitive to poor soil and poor soil management than most of the open-pollinated varieties that are commonly used.

Either the sensitive and responsive factors in hybrids or the high yielding ability of hybrids, or both, have given more importance to recent data from Illinois soil experiment fields, subsidiary cooperative and observational experiments, which data indicate that certain soils in Illinois are now deficient in readily available potassium. Because some interesting relationships have been found to exist in connection with potassium in permanent systems of soil improvement and hybrid corn, it seems worth while to briefly discuss the more important factors involved and present some of the data secured leading up to those relationships.

Chemical studies in connection with crop yields have pointed out some of the reasons why this unexpected change in potassium availability has taken place. With total analysis showing an abundance of potassium in the soil the potash problem seemed at first only a simple one of liberation. Cropping and soil treatment systems designed for the purpose of liberating potassium showed definite success as measured by crop yields for one or two rotations. However, continuation of the liberating process for two, three, or more rotation periods caused conditions to change. Crop yields declined. Applications of animal manures, strawy residues, or potassium fertilizers retarded the decline.

Available Potash

In studying this relationship chemists learned that only a small proportion of the total potassium in the soil becomes available for plant use. Intensive cropping systems and soil management practices, planned to raise the general productive level of the land, quickly exhaust the readily available portion of potassium and new supplies cannot become available in large enough quantities to meet the demand of a large, rapidly growing, and high yielding crop like corn.

Suffice it to say, that for this discussion the problem of supplying potassium for corn production is definitely with us. Potassium deficiencies can be readily created and in fact very frequently occur on the upland light and dark-colored soils where total analyses show an abundance of potassium present. Deficiencies are most likely to be found, and should be looked for, after growing several crops of deep-rooting

legumes such as alfalfa or sweet clover. There is even more likelihood of a definite response when the growing of a deep-rooting legume crop has been preceded by heavy applications of limestone and phosphate. In fact, most soils need limestone and phosphate applied before they can grow maximum crops of alfalfa and sweet clover.

When limestone, phosphate, and active organic matter, such as that supplied by deep-rooting legumes, are not abundant, then potassium is not likely to be the first limiting element. Chemical tests should be used to determine availability where there is any doubt as to whether or not the supply of plant food is sufficient.

In accordance with the idea already expressed, a potassium deficiency was actually created on a Muscatine silt loam at the Dixon soil experiment field. Muscatine silt loam is one of the best dark-colored soils for corn production in the State and supposedly well supplied with potassium. Yet by the use of an intensive 3-year rotation consisting of corn, oats, and wheat, and by the use of a deep-rooting legume, sweet clover, as a green manure crop in 2 of the 3 years of the rotation, a condition was quickly developed which gave good response to the application of potash fertilizers.

This experiment was set up for the purpose of studying the relative value of various carriers of potassium. The soil had been made highly productive during previous years of cultivation by heavy applications of limestone and rock phosphate.

The results, which are given in table 1, illustrate how quickly potassium deficiency developed in a good corn-belt

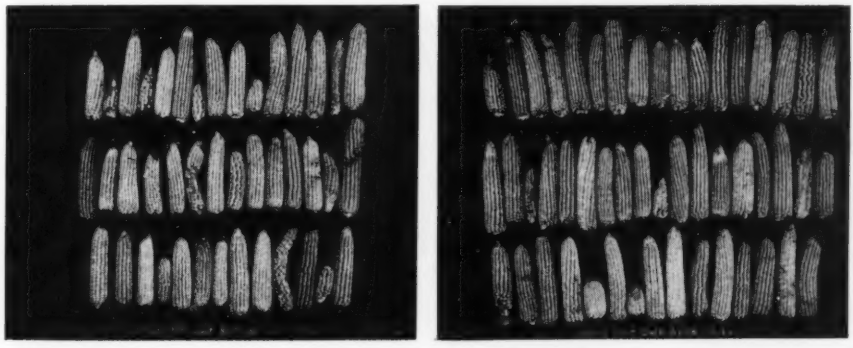
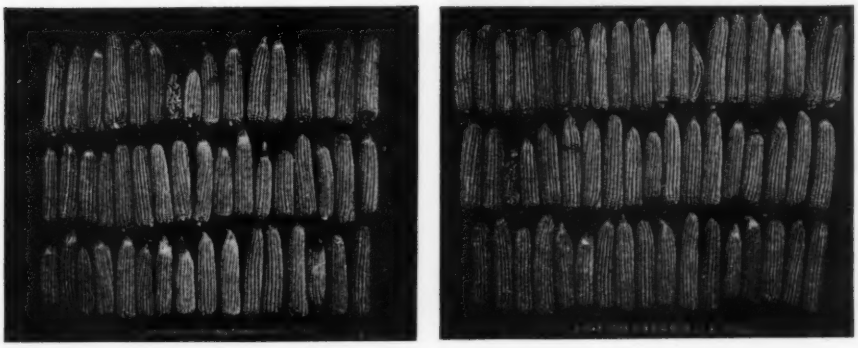


Fig. 1—Effect of germ plasm on corn performance. Above, open-pollinated corn without (left) and with soil treatment (right). Below, the same variety top-crossed with an inbred line which transmitted uniformity and quality (left, no fertilizer; right, fertilized). R=residues, sweet clover green manure. L=limestone, 8 tons over 20-year period. P=rock phosphate, 4 tons over 20-year period. K=muriate of potash, 100 pounds an acre a year.



soil. During the first 3 years of the rotation there was no apparent influence of the potash fertilization. In this first period the sweet clover did not have ample opportunity to become effective in supplying large quantities of active organic matter and nitrogen. However, in the second period when the supply of nitrogen and organic matter was ample to produce larger yields, the soil demonstrated, responding to potash fertilization, that it could not supply enough potassium from its own resources to take care of the demand of the corn crop.

For the most part only those factors

TABLE 1—CORN YIELDS FROM THE DIXON SOIL EXPERIMENT FIELD SHOW HOW GOOD CORN-BELT SOILS MAY RESPOND TO POTASH FERTILIZATION

	RLP check	RLP straw	RLP K_2SO_4	RLP KCl
	bu.	*bu.*	*bu.*	*bu.*
Aver. first 3-year rotation	69.0	69.5	71.5	70.0
Aver. second 3-year rotation	66.2	72.7	79.2	78.7
Difference	−2.8	3.2	7.7	8.7
Increase over check second 3 years	....	6.5	13.0	12.5

R = sweet clover, cornstalks; L = limestone; P = rock phosphate.
K_2SO_4 = potassium sulfate; KCl = potassium chloride.

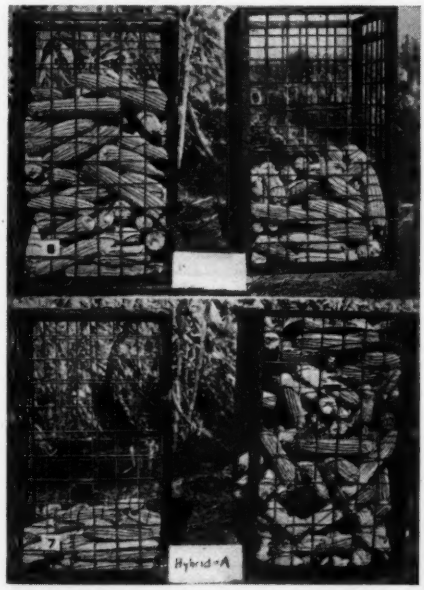


Fig. 2—Ear rot damage on two hybrids that were grown on a well-fertilized soil. At the top is a resistant strain yielding 81 bushels of corn with 68 per cent of the ears of a desirable quality. In the bottom cages is a susceptible strain which yielded 85 bushels per acre, but 80 per cent of the ears were undesirable because of ear rot infection. The percentage figures are by weight. The desirable ears are on the left.

outside the plant itself have been considered in studies having to do with nutritional problems of cereal crops. There has not been a very concentrated effort to study genetic characters in relation to plant nutrition. Recently stimulation has been given to the idea of differences in plant response by the rapid and successful development of the hybridization or pure line method of breeding corn. The hybridization method of developing superior strains furnishes a means whereby it seems wholly probable to develop plants that are superior in their ability to utilize plant-food material in corn production to a greater extent than has been possible in the past, figs. 1, 2, and 3.

Comparisons have been made during the last 3 years between some of the better hybrids and a standard open-pollinated variety of corn on soils varying in productivity. The data used for this discussion were secured from two areas at Sibley, Illinois, on the Sibley Estate farms. One area was a relatively low productive soil type and the other a relatively high productive soil

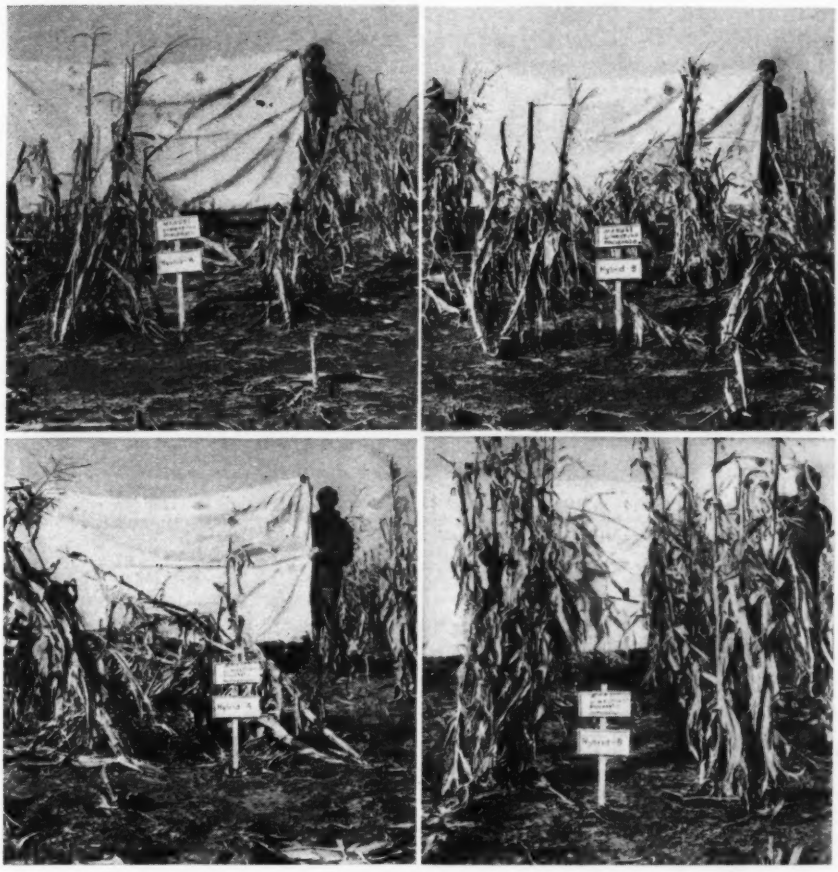


Fig. 3—Lodging resistance, a genetic character important in efficient use of plant-food material. Left: a strain of corn which was unable to recover from root damage even when properly nourished. Right: a strain which was able to make use of potassium to recover from root damage and stand erect.

type. In these tests the superiority of the hybrids was more pronounced on the highly productive level. Some hybrids were superior to others on both soils. All hybrids were superior to the open-pollinated corn on the good soil, but all hybrids were not superior to the open-pollinated corn on poor soil.

By using the yield of the standard open-pollinated variety as 100 per cent for comparison, the difference in productivity between the two soils was calculated for both the standard variety and for the average of the five best hybrids. Measured by these two yardsticks the productivity between the areas was definitely different. Annual calculations are graphed in chart 1. The open-pollinated corn averaged for the 3 years 82 per cent more on the good soil than on the poor soil, an annual difference of 49, 104, and 92 per cent respectively. The five best hybrids averaged 109 per cent more on the good soil than on the poor soil with an annual difference of 76, 142, and 111 per cent respectively. The difference between 82 and 109 per cent or 27 per cent represents that superior factor or germ plasm within the plant

(*Turn to page* 40)

Effect of potash on cotton in 1938. The plat to the left of the picture received no potash, while 30 pounds of potash were applied to the plat on the right. Note the lack of foliage on the left. Sandhill Experiment Station, Columbia, South Carolina.

The Importance of Potash *To* Southern Agriculture

By G. B. Killinger

South Carolina Agricultural Experiment Station, Clemson, South Carolina

FOR many years Southern agriculturists have realized to some extent that a complete fertilizer was necessary in making a cotton crop. The importance of nitrogen and phosphates was realized at an early date, as well as a general knowledge as to their function. Symptoms of nitrogen and phosphate deficiencies are easily recognized. In more recent years extensive investigations have been carried on at a number of stations in regard to symptoms of potash deficiencies. The term "cotton rust" has been used to designate this condition.

Since the problem of crop control, soil conserving, and soil-building practices has become of national importance, it seems that certain of the plant-food deficiencies are more in evidence than heretofore. Why should this be? The following tables (I and II) illustrate how legumes known as soil-improving crops will deplete the soil of its available potash.

These data show almost conclusively that our Southern agriculture with the staple crop as cotton supported by corn and grain may suffer severely from want of potash, if planted following one or more crops of the common legumes.

A report published in 1936 at the Arkansas Experiment Station reporting on results from the Cotton Branch Experiment Station in Lee County clearly points out the value of potash on land subject to cotton rust. Their experiment was set up to study the control of

both wilt and rust on cotton, and they concluded that potash should be applied to correct the rust factor, while wilt-resistant varieties would help solve the wilt factor.** Later results from the same station indicate that potash also will aid in the control of cotton wilt.

The absolute necessity of potash on certain soils, particularly for cotton, has been borne out by experiments at a number of experiment stations.

In setting up a number of cooperative experiments in South Carolina to determine the need for potash as well as the time and rate of application, representative farmers and representative soil types were used for the experiments in both the Piedmont and Coastal Plains section of the State. The time and rate of applying potash for cotton is summarized in table III. This table gives results from field experiments in

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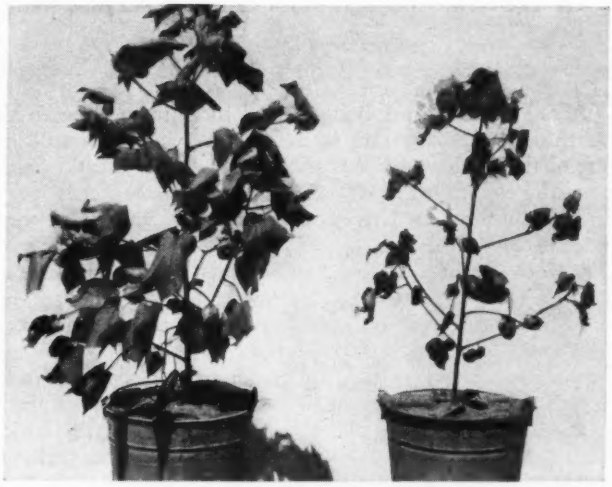


The plant on the left received 30 pounds of potash, while the one on the right received none. Note the shedding of leaves by the plant receiving no potash.

**Ark. Exp. Station Bulletin 358.

TABLE I—UTILIZATION OF POTASH BY LEGUMINOUS CROPS*

Crop	Yield in tons	Potash (K_2O) Pounds per acre
Lespedeza	2.0	80.4
Crimson Clover	1.5	39.3
Vetch	2.0	107.2
Soybeans	3.0	110.0
Cowpea-hay	3.0	88.2
Alfalfa	4.0	178.4
Red Clover	2.0	83.2

TABLE II—UTILIZATION OF POTASH BY CLEAN-TILLED OR CASH CROPS*

Crop	Yield	Potash (K_2O) Pounds per acre	
Cotton	500 lb. Lint	3.1	15.1
	1,000 lb. Seed	12.0	
Corn	50 Bu. grain	10.0	39.7
	1.5 Ton stover	29.7	
Wheat	25 Bu. grain	5.2	27.4
	1.5 Ton Straw	22.2	

* Ref. National Fertilizer Association Pamphlet No. III.

Grandfather Rothamsted

By Ford S. Prince

New Hampshire Agricultural Experiment Station, Durham, New Hampshire

INVITATIONS are being issued for the 100th anniversary of the founding of the Rothamsted Experiment Station, the oldest in the world. Founded in 1843 by Sir John Lawes to test some theories regarding the role of the various elements in crop production, this station now presents data covering almost a century of work with wheat, hay, and certain other crops grown continuously on the same soils under a variety of fertilizer treatments.

It was with a sense of awe, almost of reverence, that I approached the grounds of the Rothamsted Station at Harpenden, England, last August to spend some time in looking at what is now styled these "classical experiments." One can always read about them and study the data that is issued from time to time, but the real thrill comes in walking out over "The Park," Broadbalk field and the other long-time trials to actually see the crops growing on the soils from which accurate records have been kept over such a long period.

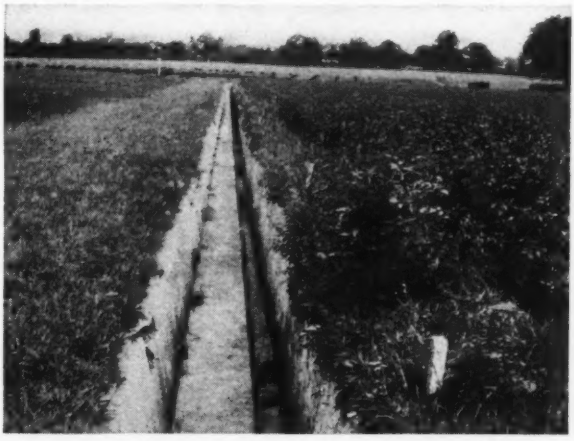
If you are interested in agriculture you are more than welcome at Rothamsted. If you read the English papers you would find an occasional press release about the forthcoming centennial and at the same time a suggestion that there are things to see there which might be valuable to you if you rely on the soil for a livelihood.

If you were an English farmer you would probably accept one of these invitations and spend a day or so there looking around. And if you did go, you would be guided by a man who has little time for anything except to conduct visitors about the place, a well-informed person who can tell you how much hay has come off the various plots in the Park, when Broadbalk field was started, and what the yield of wheat has been from the several treatments. Then if you wish to see personally any of the workers who have charge of the many details of the experiments, the guide will hand you over to them.

A complete fertilizer and lime were used on the left, no lime on the right. Sulphate of ammonia was the nitrogen carrier. Note the hassocky sod and bare spots on the right due to strong acidity.

When I went there I carried a letter of introduction from another British Experimental Station, and since I was also a visitor from the United States I had a most cordial meeting with Vice Director Keen and Deputy Director Schofield before I was permitted to go out with the guide to feast my eyes on these long-time experiments for which Rothamsted is justly famous.

At Rothamsted the older or "classical" experiments, as they are now often called, started by Sir John Lawes and largely financed by him for nearly 60 years, are still maintained chiefly for reasons of fundamental research, especially as they may contribute to our knowledge of changes in the soil caused by fertilizer applications over a long period of years. They also serve as a basis for statistical and other studies. Other experimental fields inaugurated in more recent years contribute, however, to the solutions of current problems in much the same manner as the field plots of any typical American station.



The drainage system of Broadbalk Field. From the study of the water from these mains has come a good deal of our common knowledge concerning the leaching of plant-food elements from the soil.

Critics might say that it is useless to continue experiments for so long a period, especially as they may not conform to farm practice in the use of fertilizer. "No one wants to grow wheat or hay on the same land for 100 years or more," some might say. Still, we do grow pastures on the same soil this long and longer, and we are vitally interested in the long-time effects of certain fertilizer applications to the soil, and for this reason we are all more or less interested in Rothamsted.

I am rather glad that there is one place in the world where such a thing can be done. Even with all this long-time work, the staff finds time to carry on other field plots and delve into problems of more immediate moment which amply justifies their work in helping British and world agriculture.

In the 1937 guide book to Rothamsted it is stated that, "The purpose of the work . . . is to discover the principles underlying the great facts of agriculture and to put the knowledge thus gained into a form in which it can be used by teachers, experts, and farmers for the improvement of the standard of farming."

This apparently has been the purpose of Rothamsted since its inception, for at that time Sir John Lawes had just inherited the estate under a heavy load of debt, and he foresaw that if he was to hold it and make it profitable, it would be necessary to use cropping and fertilization methods somewhat different from those in vogue at the time. Besides this he had some very definite ideas about plant nutrition which were at variance with others of the period, and these he wished to test. The fact that he happened to be correct in his preconceived notions about plant nutrition was probably a stimulus to the project in its early years and may account for the unbroken record of the trials in the long run.

But let us get back to our guide and take a walk over the plots to see the

crops and to learn what the great lessons are from these classical experiments.

Reading about the "Park" has always fascinated me, for this is the field that has been in grass and mowed for hay each year since 1856 with no plowing or seeding during that period. So we went there first.

The soil is a heavy loam and the land in the park is quite level. The rainfall of the area is considerably under 30 inches annually; still our guide informed us that yields of hay from the better treatments have averaged more than 2¾ tons for the first cutting alone during the past 20 years. In this country we consider this a fairly good yield the first year after seeding, and these plots are 82 years old!

Results of Fertilizer Tests

The best yields, the guide informed us, are from the plots getting complete fertilizers, supplemented by lime if necessary, or from those that are top-dressed with farm manures. Nitrogen fertilizers only, while they stimulate early growth, tend to crowd out clovers and to materially reduce the number of species in the stand.

Fertilizers carrying phosphoric acid and potash tend to increase the amount of volunteer legumes and to improve the quality of the hay. In fact, the best quality hay comes from the phosphorus-potash plots. If potash is omitted, clovers are seriously reduced and the yield suffers as well.

We noticed some plots on which the stand was very poor and hassocky. These, the guide explained, get sulphate of ammonia, a nitrogen carrier that increases the acidity of the soil. With frequent lime applications these evil effects can be overcome.

He illustrated this with the records on plot 9 which receives complete minerals and sulphate of ammonia. The unlimed end has averaged 32 cwt. of hay each year for the past two decades, while the limed end has yielded 49 cwt. Plot 14, getting nitrate of soda and minerals, has yielded 52 and 51 cwt. respectively for the unlimed and limed portions, while plot 7, which gets minerals without nitrogen, shows 26 and 33 cwt. for the unlimed and limed sections. Lime has been top-dressed recently at the rate of one ton per acre every 4 years on one half of each of the plots to give these comparisons.

We have similar experiences in this country, of course, but none that have been carried on over such a long period. The point of it all is that lime must be used, where necessary, as in the sulphate of ammonia plots, whereas lime has apparently been wasted when superimposed on the nitrate of soda treatment, for this substance tends to make the soil more alkaline. Failure to use lime on the sulphate of ammonia plots has rendered the herbage very susceptible to winter-killing, which probably accounts as much as anything else for the low average yield.

Results from Manure

The manured plots are likewise interesting, for these actually show a decrease for lime applications, a decrease which has grown larger with the years. When the guide made this assertion, I asked him to repeat it, for I thought I had misinterpreted what he said. He assured me, however, that I had it right the first time, so I began to ask the reasons for this strange behavior. My questions elicited the information that the workers in charge were not quite certain as to the exact cause and had laid out newer plots a number of years ago to try to get at the bottom of the matter. On these additional plots light applications of lime gave an increase in hay for the first 4 years, a smaller increase for the next 4 years after the next application, and after the third lime treatment hay yields were reduced below the unlimed plots. Heavy lime dressings gave no increase in yield at any time, and since the second liming, both first and second crop yields have been reduced.

This strange effect of lime is doubtless tied up to some extent with the

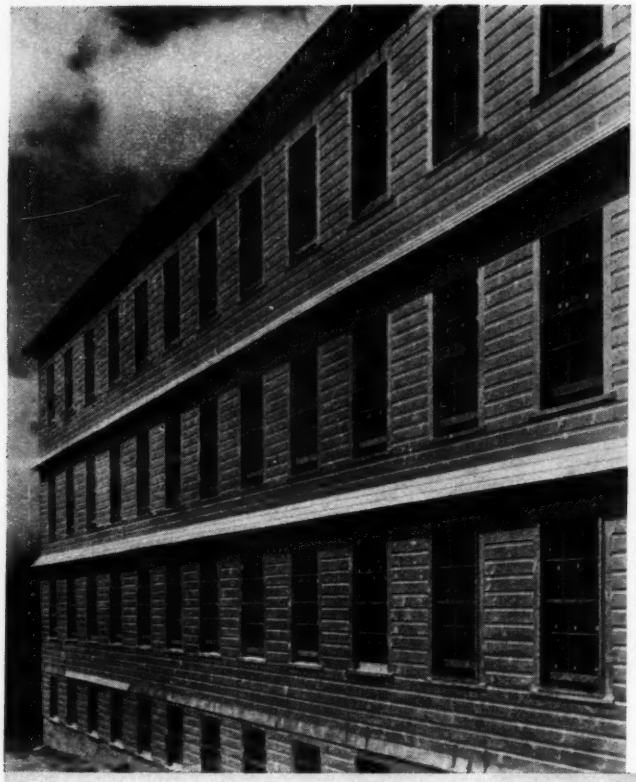
(*Turn to page* 43)

PICTORIAL

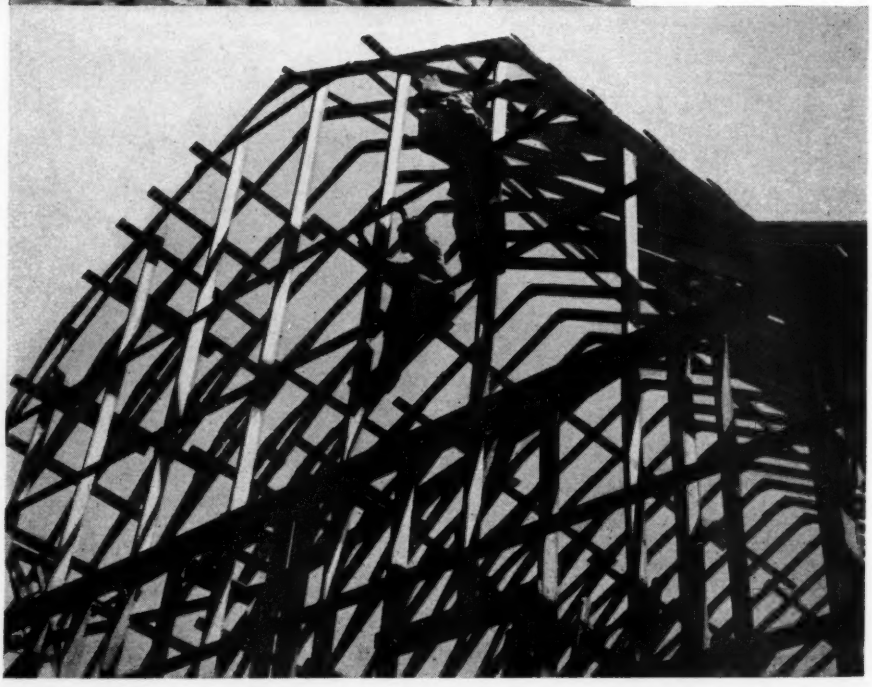
MAKE YOUR FIRST ROW STRAIGHT TO THAT FENCE POST.

The one-man plow is giving way before the increasing efficiency of labor-saving machinery.

There's still work for these fellows, but tractors are carrying the load on larger farms.



Farm Skyscrapers: Left, a veritable country apartment building is this "four-decker" which houses hens. Below, as sure of foot and skill as the steel riveters are the men who work aloft on new barns.



The Editors Talk

Grass-Consciousness

In all too many parts of the country, grass* is relegated to the poorer parts of the farm. The term "back pasture" indicates where pastures belong in the popular concept of growing grass. In contrast to this the best land is given to the tilled crops. Corn, cotton, tobacco, sugar beets, and a host of other crops all must be grown on the richest acres of the farm because there is money in these crops, and apparently much less profit in grass whether grown for hay or pasture or a soil-building crop.

This point of view is changing. America is developing another concept of grassland culture. With this change in viewpoint we are passing,—slowly it is true,—from grass-mindedness to grass-consciousness. This eventually must lead to a philosophy of grassland culture and ultimately to a better class of all-round farmers, for the successful establishment and maintenance of a good grass cover requires skillful application of the best agronomic information available. A successful grassland farmer, in other words, must be a very good all-around farmer.

The newer viewpoint has been expressed by a number of workers. Among them is John Abbott, formerly on the agronomic staff of the National Fertilizer Association, who was a pioneer and effective worker in this field. More recently it has been admirably expressed by P. V. Cordon of the U. S. Department of Agriculture in a paper entitled, "The Place of Grass in an Erosion-Control Program," presented at the last meeting of the American Society of Agronomy. At the outset the author pointed out that the title assigned him was somewhat narrow and incidental to the grass problem. The real trend should be toward a grassland agriculture and soil conservation and erosion control should be natural results of such culture.

"America today is definitely grass-minded," Mr. Cordon said. "But America still lacks the profound grass-consciousness which prompts Europeans to take advantage of favorable physical conditions, to grow more and better grass, and to utilize it to better advantage. . . . Grass-mindedness inspires grass culture for specific purposes, as for example a corrective of soil erosion. Grass-consciousness, on the other hand, regards such specific use of grass as incidental to its primary uses. It is grass itself that is important—grass as a farm crop which is worthy of as good land and as intelligent culture as any other crop."

The author considers that America's topsy-turvy thinking with respect to grass is becoming a thing of the past. We are beginning to sense the value of grass in protecting us from the ravages of drought, wind, and flood, and as a substitute for many tilled cash crops of which there is a current over-production. Also, the

*Grass, as used in this paper, refers to grass and legume mixtures as they commonly occur in pastures and meadows.

difficulties in replacing the grass cover, which the country's destruction of grass has made necessary, develop a better appreciation of the value of grass itself.

A sound grassland philosophy, suggested by the author, would take account of at least the following:

1. The inclusion of grass in cropping systems as grass and not as an expedient,—grass planted in rotation because farmers appreciate its intrinsic value.
2. The conviction on the part of farmers that grass is economically feasible not only as a source of feed for livestock, but as a soil-improving crop to be reflected in the returns from other crops.
3. The alignment of all research, educational, and action agencies to view grass culture broadly and with respect to its place in farm practice within wide areas. Not only would the author emphasize such work and thinking among soil and crop specialists but would also include the animal husbandman, the nutritionist, the economist, and other groups interested. He would include county planning boards and conservation districts from which would come both thought and action by farmers and business men alike.

This paper by P. V. Cordon merits the close attention of many different groups of agricultural workers. It is undoubtedly true that our experimental and research work in reference to pastures and grassland generally has much of the incidental nature in its concept and technique. It needs to be correlated and related to a broad and sound program of grassland agriculture. The emphasis on these points by the author is timely indeed.

State Planning

State Planning Boards are now in existence in 45 States and in the District of Columbia, Hawaii, and Alaska. Some $2,000,000 was spent on planning in 1938 and more than $11,000,000 has been spent from and including 1934. While State Planning as a movement has its roots in activities started in some States years ago, its remarkable growth since 1933 is one of the outstanding developments of recent years.

What are State Planning Boards? How are they appointed and elected? What can such Boards do? These and many other questions are discussed in a report by the National Resources Committee entitled "The Future of State Planning," obtainable through the U. S. Government Printing Office.

As the report points out, "The work of State planning boards consists of the laying out of interrelated, long-range programs leading to the conservation and most beneficial use of the resources of the State. The process of planning involves the analysis of emerging problems and the projection of a comprehensive program of action correlating the planning programs of State agencies. It is essential that State plans be related to local and Federal plans. The prosecution of related programs by the different levels of government affecting the same people in the same area creates a serious need for collaboration among the agencies concerned in the planning of their activities."

The report discusses the subject of the future of State Planning from four broad points of view, namely, The development and present status of State planning, Functions and opportunities of State Planning Boards, The position of the Planning Board in the governmental structure, and Relationships of the National Resources Committee and State Planning Boards. The report also gives recommendations for the future and contains a very useful directory of members of the State Planning Boards and a bibliography of publications.

Anyone interested, and practically all agricultural workers are interested in the future of their States, can well afford to obtain a copy of this report of the National Resources Committee.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

¶ "What Fertilizers for Small Grains and Seedings of Clover and Alfalfa" is the theme of a recent mimeographed leaflet of that title issued by the Soils Department of the University of Wisconsin, under the authorship of C. J. Chapman. This is a concise report on the results of 102 cooperative fertilizer demonstrations conducted principally on oats, barley, and legume hay in 1938, with a summary of all data obtained from hundreds of similar tests for the past 6 years.

Comparing 20% superphosphate with 0-20-10 in the residual carry-over benefit to the hay crop, largest net returns have been observed where the potash was applied in addition to the phosphate. Based on these results, the University is advising more and more potash for grain and legume seedings, even on many of the heavier silt and clay loam upland soils to obtain maximum results. Mixtures such as 0-20-10 are now quite generally recommended for the silt and clay loam soils, 0-20-20 for the sandier soils, and 0-9-27 for mucks, peat, and black bottom soils. Complete fertilizers should be used for small grain on the lighter colored loams. Analyses such as 3-18-9 or 3-12-12 are appropriate under these conditions, the leaflet states. In any case, specific recommendations for the different soils are determined best by soil tests and by knowing the requirements of the crop to be grown as well as the crop history of the field.

Professor Chapman says that the application of 200 to 300 pounds of commercial fertilizer per acre at the time of seeding down fields to alfalfa and clover and repeated every rotation will gradually build up the fertility of the farm as a whole. Larger grain yields, and bigger alfalfa and clover crops will add to the home-grown feed supply, thus cutting feed costs and increasing the possible livestock carrying capacity of the farm. The sum total of all benefits provided is a greater net income from Wisconsin farms.

¶ Facts derived from a survey of pasture management methods employed on 70 Rhode Island dairy farms in 1936, supported by data from extensive pasture studies within the State, form the basis for many informative suggestions presented by T. E. Odland and R. S. Shaw on fertilizers, liming, seeding mixtures, and pasture management in Station Bulletin 270, "Pasture Improvement Practices in Rhode Island." Farmers, according to the survey, are making increased use of tillable land for pasture purposes. Nearly all who were interviewed agreed that fertilizing their pastures had proved profitable. A complete fertilizer was most commonly used, and liming for pastures was found to be a growing practice. Farm manure was used by more than half the farmers. Kentucky bluegrass and white clover became the dominant plants established in permanent pastures under a good system of fertilization and management. On unfertilized permanent pastures, Rhode Island bent was found to be the predominant grass.

Investigations on costs and returns from pasture fertilization on a number of farms showed a complete fertilizer and lime program for permanent pastures resulted in greatly increased grass yields and brought about a decided saving in cost of milk produced. As a general fertilizer for top-dressing permanent pastures, an 8-16-16 or similar grade at the rate of 300 pounds per acre is suggested. The grade and amount may be modified to fit particular conditions. Lime as required should be applied as part of the soil-improvement program.

Pasture rotation systems, suggested seeding mixtures, supplementary pasture crops, and other points to consider for improving Rhode Island pastures, are also explained in the publication.

"Anatomical Symptoms of Nitrogen, Phosphorus, and Potassium Deficiencies in Seedling Hypocotyls of Tomato (Lycopersicum esculentum Mill.)," Agr. Exp. Sta., Fayetteville, Ark., Bull. 366, Nov. 1398, Victor M. Watts.

"Fertilizer Studies by the Division of Plant Nutrition," Univ. of Calif., Berkeley, Calif., Mimeo., Oct.-Nov. 1398. Albert Ulrich.

"Home Mixing of Fertilizers," Waltham Field Sta., Mass. State Col., Amherst, Mass., Mimeo., Jan. 1, 1939.

"Fertilizer Recommendations for 1939-40 for Crops Grown on Sandy and Sandy Loam Soils," Agr. Ext. Serv., East Lansing, Mich., R. J. Baldwin, Dir.

"Fertilizer Recommendations for 1939-40 for Various Crops Grown on Loam, Silt Loam, and Clay Loam Soils," Agr. Ext. Serv., East Lansing, Mich., R. J. Baldwin, Dir.

"Fertilizer Rates and Analysis Tests," Agr. Exp. Sta., State College, Miss., Inf. Sheet 164, Dec. 1938.

"Approved Fertilizers for Different Crops Grown in North Carolina," Agr. Exp. Sta., Raleigh, N. C., Agr. Inf. Cir. 116, Jan. 1939.

"North Carolina Summary of Tobacco Demonstrations, 1938, for the Coastal Plain and Piedmont Sections, Side-dresser Reports for Both Stations," Agr. Ext. Serv., Raleigh, N. C.

"Fertilizer Recommendations for Soil and Crops in Wisconsin," Agr. Ext. Serv., Madison, Wis., Mimeo., C. J. Chapman.

Soils

¶ U. S. Department of Agriculture Circular 492, entitled "Pecan Soils of the Gulf and Southeastern States and Maintenance of Their Fertility," by J. J. Skinner, E. D. Fowler, and A. O. Alben, describes the character of soils utilized for pecan growing in the Southeastern and Southcentral belt and means for maintaining their productivity. Approximately 95 per cent of the pecan acreage of the upland soil series is located on 7 of the 31 series more or less adapted for pecan growing. These are Ruston, Norfolk, Tifton, Orangeburg, Greenville, Red Bay, and Cecil. Many common characteristics are to be found in these seven soils. One is that they all occur on the higher and more level areas of the uplands where drainage is well-established to such depths that roots may grow to good advantage. Of the 24 valley-land soils discussed, probably more than 80 per cent of the pecan crop is produced on 9 bottom soils. These consist of members of the Miller, Yahola, Sharkey, Sarpy, Trinity, Pledger, Catalpa, Cahaba, and Kalmia series. The individual characteristics of the upland and valley soils are briefly described in the circular.

Pecan production on the upland and river-bottom soils may be most profitable when the soils are supplied with organic matter and liberal amounts of fertilizer. Green manure crops commonly used include velvetbeans, soybeans, cowpeas, clovers, sweetclover, crotalaria, Kudzu, lespedeza, Austrian winter peas, vetches, and small grains. Increasing the growth and vegetation of cover crops in pecan orchards by the use of commercial fertilizer maintains the soil fertility at a higher level without additional cost of fertilizing the orchard. The phosphate or phosphate and potash can be applied when the cover crop is planted in the spring or fall, and nitrogen applied to the trees in early spring. The proper ratios will vary a great deal according to the soil, both upland and valley. Suggestions regarding some of these, in accordance with results obtained from fertilizer investigations in several States, are provided. Information on sources of nitrogen, phosphoric acid, and potash, preparation of fertilizer

mixtures, and time of applying the fertilizer is also detailed in the circular.

"Soil Testing Methods, the Universal Soil Testing System," Agr. Exp. Sta., New Haven, Conn., Cir. 127, Jan. 1939, M. F. Morgan.

"Soil Survey of Monroe County, New York," U. S. D. A., Washington, D. C., Series 1933, No. 17, May 1938, A. T. Sweet, W. J. Latimer, C. S. Pearson, C. H. Diebold, W. W. Rietz, C. P. Mead, Wilber Secor, and Montaque Howard, Jr.

"Soil Survey, Edgefield County, South Carolina," U. S. D. A., Washington, D. C., Series 1935, No. 1, Oct. 1938, F. R. Lesh, W. J. Geib, A. E. Shearin, and C. H. Wonser.

"Soil Survey, Bee County, Texas," U. S. D. A., Washington, D. C., Series 1932, No. 30, Oct. 1938, Howard M. Smith and R. M. Marshall.

Crops

¶ Robert Schmidt and J. G. Weaver, in North Carolina Extension Circular 230, "Dahlias for the Garden," inform dahlia fanciers that moderate fertilization not only induces good flowers but also produces roots that will keep over winter. For poor and run-down soils, the authors recommend turning under liberal amounts of well-rotted manure several weeks before planting time. A handful of bone meal or a small application of a well-balanced fertilizer mixed with the soil at planting will aid the growth of the young plant. In rich soils no fertilizer is necessary at planting. When the plants are about 12 inches high, they should be top-dressed with a handful of a good potato or truck fertilizer, using caution that it does not come closer than 5 or 6 inches to the plant. This procedure could be repeated when the buds begin to appear and every 3 or 4 weeks during blooming season until the middle of September. A mixed fertilizer containing 5 per cent nitrogen, 7 to 8 per cent phosphoric acid, and 5 to 6 per cent potash is suitable for soils of fair fertility.

A description of some of the popular varieties is outlined in this interesting circular.

"Fiftieth Annual Report, Fiscal Year Ending June 30, 1938," Agr. Exp. Sta., Fayetteville, Ark., Bul. 368, Dec. 1938, C. O. Brannen.

"Report of the Minister of Agriculture for the Dominion of Canada for the Year Ended March 31, 1938," Ottawa, Canada, 1938, James G. Gardiner.

"Progress Report of the Dominion Botanist, for the Years 1935 to 1937 Inclusive," Dominion of Canada Dept. of Agr., Ottawa, Canada, 1938, H. T. Güssow.

"Sixty-third Annual Report of the Ontario Agricultural College and Experimental Farm 1937," Agr. Exp. Farm, Guelph, Ontario, Canada, 1938.

"Results of Experiments 1931-1937," Dominion Exp. Sta., Morden, Manitoba, Canada, 1938, W. R. Leslie, Superintendent.

"Results of Experiments 1931-1936 Inclusive," Dominion Exp. Sta., Kentville, N. S., Canada, 1938, W. S. Blair, D.Sc., Superintendent.

"Results of Experiments 1931-1936," Agr. Exp. Sta., Kapuskasing, Ontario, Canada, 1938, J. P. S. Ballantyne, Superintendent.

"Results of Experiments 1931-1936 Inclusive," Experimental Sub-station, Regina, Sask., Canada, 1938, John Cameron, B. S. A., Officer-in-Charge.

"Agricultural Research in Colorado, Fifty-first Annual Report Colorado Experiment Station 1937-38," Agr. Exp. Sta., Fort Collins Col., 1938.

"Annual Report State Board of Agriculture 1937-1938," Quarterly Bulletin, St. Bd. of Agr., Dover, Del., Vol. 28, No. 3, 1938.

"Peach Varieties for Florida," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 527, Jan. 1939, G. H. Blackmon.

"Transplanting Peach Trees," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 526, Jan. 1939, G. H. Blackmon.

"Hawaii Truck Crop Reporting Service," Agr. Ext. Serv., Honolulu, T. H., Ext. Bul. 34, Jan. 1939, Kenneth I. Hanson and Thomas O. Frazier.

"Publications Available for Free Distribution," Agr. Exp. Sta., Moscow, Idaho, Cir. 79, Nov. 1938.

"Kentucky Fruit Notes," Agr. Exp. Sta., Lexington, Ky., Vol. 1, No. 6, Feb. 1939.

"Proceedings in Commemoration of the Fiftieth Anniversary of the Kentucky Agricultural Experiment Station, Wednesday, Sept. 25, 1935," Agr. Exp. Sta., Lexington, Ky., Bul. 388, Nov. 1938.

"Comparative Effects of Furrow, Level, and Ridge Culture on Corn Production at Baton Rouge, Louisiana," Agr. Exp. Sta., University, La., Bul. 302, Nov. 1938, H. B. Brown and H. C. Lovett.

"Report of Progress for Year Ending June 30, 1938," Agr. Exp. Sta., Orono, Maine, Bul. 391, June 1938.

"Production of Root Crops for Forage in Michigan," Agr. Exp. Sta., East Lansing, Mich., Cir. Bul. 168, Jan. 1939, B. R. Churchill.

"Mississippi Farm Research," Agr. Exp. Sta., State College, Miss., Vol. 2, No. 2, Feb. 15, 1939.

"Corn Hybrids for Missouri," Agr. Exp. Sta., Columbia, Mo. Cir. 201, Jan. 1939, G. F. Sprague.

"Spring and Winter Wheat Varieties Under Irrigation," Agr. Exp. Sta., Bozeman, Mont., Bul. 365, Dec. 1938, E. J. Wellhausen.

"White Top, Holding It Under Control by Cultivation, Followed by the Establishment of a Sod of Pasture Grasses and Clovers," Agr. Exp. Sta., Reno, Nev., Bul. 149, Nov. 1938, C. E. Fleming and C. A. Brennen.

"Improved Blueberries," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 215, June 1938, L. P. Latimer and W. W. Smith.

"Woody Plants with Ornamental Fruits," Agr. Exp. Sta., New Brunswick, N. J., Cir. 380, Oct. 1938, Charles H. Connors.

"Legume and Grass Silage, A Survey of Methods and Results on 380 Northeastern Farms," Agr. Ext. Serv., Ithaca, N. Y., Bul. 391, May 1938.

"Muskmelon Growing in New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 151, July 1938, W. D. Enzie and G. J. Raleigh.

"Spacing Virginia Type Peanuts," Agr. Exp. Sta., Raleigh, N. C., Agr. Inf. Cir. 115, Jan. 1939, R. L. Lovvorn and P. H. Kime.

"Growing Early Vegetable Plants," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 231, Dec. 1938.

"Control of Fusarium Wilt of Cotton," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 233, Jan. 1939, Luther Shaw.

"Approved Practices for the Production of Cotton," Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 234, Feb. 1939.

"Breeding New Strawberry Varieties," Agr. Exp. Sta., Raleigh, N. C., Bul. 320, Feb. 1939, George M. Darrow and E. B. Morrow.

"The Relation of Certain Physical Fiber Properties in Improved Cotton Varieties to Spinning Quality," Agr. Exp. Sta., Raleigh, N. C., Tech. Bul. 58 Oct. 1938, Jerry H. Moore.

"Cloth Houses," Agr. Exp. Sta., Wooster, Ohio, Bul. 594, Oct. 1938, Alex Laurie and Conrad Link.

"Winter Injury of Fruit Trees in Ohio," Agr. Exp. Sta., Wooster, Ohio, Bul. 596, Nov. 1938, Leon Havis and I. P. Lewis.

"The Bimonthly Bulletin," Agr. Exp. Sta., Wooster, Ohio, Vol. XXIV, No. 196, Jan.-Feb. 1939.

"Science Serving Agriculture," Agr. Exp. Sta., Stillwater, Okla., Rpt. of Agr. Exp. Sta. and Okla. A. & M. College for July 1, 1936 to June 30, 1938, Lippert S. Ellis, Acting Dir.

"Report of the Puerto Rico Experiment Station, 1937," Agr. Exp. Sta., Mayaguez, P. R., U. S. D. A., Washington, D. C., Nov. 1938.

"Dawn Grasses and Their Management," Agr. Exp. Sta., Kingston, R. I., Bul. 264, July 1938, H. F. A. North, T. E. Odland and J. A. DeFrance.

"Comparison of Heights, Yields, and Leaf Percentages of Certain Sweetclover Varieties," Agr. Exp. Sta., Pullman, Wash., Bul. 365, Nov. 1938, Wilford Hermann.

"The Nutritive Value of Home Grown Roughage Rations for Dairy Cattle," Agr. Exp. Sta., Pullman, Wash., Bul. 366, Nov. 1938, R. E. Hodgson, J. C. Knott, V. L. Miller, and H. K. Murer.

"Epistle to the Farm," The Report of the Director, West Virginia Agr. Exp. Sta., Morgantown, for the Biennium 1936 to 1938, Agr. Exp. Sta., Morgantown, W. Va., Bul. 290, Dec. 1938, C. R. Orton.

"Relative Values for Milk Production of Hay and Silage Made from Immature Pasture Herbage," U. S. D. A., Washington, D. C., Tech. Bul. 649, Nov. 1938, R. R. Graves, J. R. Dawson and D. V. Kopland.

"Current Floricultural Research 1937-1938," U. S. D. A., Beltsville, Md., May 1938.

Economics

¶ An interesting survey of the potato industry in New Jersey may be found in the recent publication of New Jersey Agricultural Experiment Station at New Brunswick, "The Economic Condition of the Potato Industry in New Jersey," by Allen G. Waller and John W. Carncross. Acreage and production trends, price trends, yield developments, costs and yields necessary to meet varying prices, cost of producing potatoes in different States, the effect of the development of motorized machinery, freight rates, price of New Jersey potatoes on different markets, distribution of crop by destination, and price of potatoes compared to other farm products are among the topics discussed.

It is noted that the peak of New Jersey potato acreage was reached in 1917 when about 100,000 acres were grown. Since then, there has been considerable decline until in 1937 after gradually increasing from the low of 38,000 acres in 1930, the acreage is about 56,000, but due to increasing yields the production from this acreage is about equivalent to 80,000 of the 1920-24 acres.

The New Jersey shipping season is usually over by early fall, and comparisons over a period of years have indicated that there is apparently no set time to market potatoes. For a

number of years there was considerable advantage from early marketing, and in other years late marketing was most profitable. However, this would seem to be largely dependent upon the indicated size of the potato crop.

In contrast to practically no change for the United States as a whole, New Jersey potato yields have increased considerably in the last 10 or 15 years. For instance, in the 5-year period 1920-24 the average yield per acre in New Jersey was 132 bushels, whereas, in the 5-year period 1930-34 it had increased to 163 bushels, or approximately 24%. The United States as a whole had a yield of 108 bushels in each period.

In comparing costs and yields necessary to meet the varying costs, it is noted that with costs similar to those quoted in the Bulletin, to cover production costs, at a price of 90¢ per bushel it would require a yield of 104 bushels per acre, or at 50¢ per bushel a yield of 207 bushels. In comparing the costs in New Jersey with other areas, it is noted that the total cost per acre was somewhat higher than in some of the other comparable States, $112 in New Jersey as compared to $100 in North Carolina and $89 for the Eastern Counties of Virginia. Because of the higher yields in New Jersey and the relative advantage from the market standpoint, it is believed that the New Jersey producers would compete favorably with the other lower cost areas.

The adoption of the cultivator type tractor and other modern types of machinery has resulted in considerable decrease in the man labor required for harvesting. On 10 farms in 1936 the man labor requirement was 21 hours as compared to 37 hours on the same farms in 1926, or a decrease of 43% in labor requirement. It was also noted that the acreage operated by these farmers had been increased, and that the acreage in potatoes per farm had increased from 60 to 80. It is concluded that with the well-established channels of distribution and favorable factors of economy and production the New Jersey potato growers located on favorable soils are in a position to produce potatoes at a profit.

¶ Massachusetts fertilizer sales were 69,175 tons in the year ending July 1, 1938, as compared to 74,274 tons in the previous period, according to H. D. Haskins in the Massachusetts Control Series Bulletin No. 95, "Inspection of Commercial Fertilizers." In terms of plant food, tonnage in 1938 was 3,821 tons of nitrogen, 5,836 tons of phosphoric acid, and 4,112 tons of potash, as compared to 4,163 tons of nitrogen, 6,540 tons of phosphoric acid, 4,333 tons of potash in the 1936-37 year. Of the 45,339 tons of complete fertilizer sold, 72% was furnished in 9 different grades and 140 brands. Of all the mixed fertilizers sold, over 98% contained 14% or over of available plant food. The 10 most popular grades of mixed fertilizers sold in 1938 in order of their tonnage are as follows: 5-8-7, 4-8-4, 4-8-7, 7-6-6, 4-8-10, 6-3-6, 4-8-8, 8-16-16, 5-8-10, and 4-8-12.

¶ According to a mimeographed report published by the Department of Agronomy of Ohio State University, fertilizer tonnage in that State in 1938 amounted to 324,228 tons, which compared to 362,206 tons in the year previous, or 88% of 1937. The average analysis of all the fertilizer sold was approximately 2.28% nitrogen, 12.72% phosphoric acid, and 5.31% K_2O, representing 7,404 tons of nitrogen, 41,262 tons of phosphoric acid, 17,240 tons of K_2O. Of the total sales 166,047 tons were sold in the spring and 158,181 tons in the fall. The five leading grades in the order of their tonnage are as follows: 2-12-6, 0-20-0, 2-12-2, 0-14-6, and 2-8-10.

¶ According to the mimeographed report of the Soils Department of Michigan State College, "Tonnage of Different Grades of Fertilizer Sold in Michigan 1938," fertilizer sales in that State decreased about 9% in 1938 as

compared to 1937. The total tonnage reported to the Soils Department by the various manufacturers was 132,702 tons. Of this total, 113,465 tons were mixed goods, and the balance materials. Approximately 85.7% of the tonnage sold was composed of grades or ratios recommended by the Soils Department, and 89% of the total of mixed goods sold contained 20% or more of plant food. This compares to 85.7% in 1937, 81.2% in 1936, 77.8% in 1935, and 72.7% in 1934. By far the most important single analysis from the tonnage standpoint was 2-12-6, which constituted 46% of the total sales. The five leading grades in the order of their importance were 2-12-6, 0-20-0, 2-12-2, 2-16-8, and 2-8-16.

The 10 leading grades in the State represented 78% of the total tonnage sold, and there was a net decrease of 11 different grades offered in 1938 as compared to 1937, the result of 17 grades having been dropped and 6 new ones added.

"An Economic Study of Land Utilization in Southern Alberta." Dept. of Agr., Dominion of Canada, Ottawa, Canada, Pub. 610, Tech. Bul. 16, July 1938, G. H. Craig and J. Coke.

"Illinois Farm Economics," Agr. Ext. Serv., Urbana, Ill., No. 44, Jan. 1939.

"Tonnage of Fertilizer Reported by Manufacturers as Shipped to Kansas During 1938," Agr. Ext. Serv., Manhattan, Kan., Mimeo.

"The Fruit and Vegetable Supply of Louisville," Agr. Exp. Sta., Lexington, Ky., Bul. 387, Oct. 1938, C. D. Phillips.

"Standard of Living on Carroll County Maryland Farms," Agr. Exp. Sta., College Park Md., Bul. 422, Oct. 1938, Viola C. Teeter and Carl B. Smith.

"Farm Business Notes," Agr. Ext. Serv., University Farm, St. Paul, Minn., No. 194, Feb. 1939.

"Farm Economics," Agr. Ext. Serv., Ithaca, N. Y., No. 111, Feb. 1939.

"Fertilizer Report 1937," Pa. Dept. of Agr., Harrisburg, Pa., Vol. 21, No. 7, Gen. Bul. 555, Sept.-Oct. 1938.

"Studies in Vermont Dairy Farming. XI. Labor as a Cost of Milk Production," Agr. Exp. Sta., Burlington, Vt., Bul. 442, Nov. 1938, J. A. Hitchcock and L. N. Paquette.

"The Wheat Problem and What the Farmer Can Do About It Through the AAA Farm Program," U. S. D. A., AAA, Washington, D. C., Gen. Inf. Series, G-93, Jan. 1939.

"How the AAA Farm Program Works," U. S. D. A., AAA, Washington, D. C., Reg. Inf. Ser., SR Leaflet 301-A, SR Leaflet 301-B, 1939.

"The AAA Range Conservation Program for 1939, for Improvement and Conservation of Texas and Oklahoma Range Lands," U. S. D. A., AAA, Washington, D. C., Reg. Inf. Ser., SR Leaflet 351, 1939.

"Decision and Order of the Secretary of Agriculture Allotting the Direct-Consumption Portion of the 1939 Sugar Quota for Puerto Rico," U. S. D. A., Washington, D. C., P. R. S. O. No. 13 Jan. 5, 1939.

"Regulations Pertaining to the 1939 Price Adjustment Payment Program for Producers of Wheat, Cotton, Corn (in the Commercial Corn-producing Area), Rice, and Tobacco," U. S. D. A., Washington, D. C., P-1, Jan. 13, 1939.

"Determination of Proportionate Shares for Farms in the Mainland Cane Sugar Area for the 1939 Crop, Pursuant to the Sugar Act of 1937 (Revised)," U. S. D. A., Washington, D. C., S. D. No. 45, Feb. 1, 1939.

"Determination of Sugar Commercially Recoverable from Sugarcane in the Mainland Cane Sugar Area, Pursuant to the Sugar Act of 1937," U. S. D. A., Washington, D. C., S. D. No. 61, Jan. 31, 1939.

"Determination of Proportionate Shares for Farms in the Mainland Cane Sugar Area for the 1940 Crop, Pursuant to the Sugar Act of 1937," U. S. D. A., Washington, D. C., S. D. No. 62, Feb. 1, 1939.

"Income Parity for Agriculture, Part 1, Farm Income, Section 5, Income from Wheat, Calendar Years 1910-37," U. S. D. A., AAA, Washington, D. C., Jan. 1939.

"Agricultural Labor in the United States, 1936-1937, A Selected List of References," U. S. D. A., Washington, D. C., Agr. Ec. Bibliography 72 (Supplement 64), Mar. 1938, Esther M. Colvin, Josiah C. Folsom, and Mary G. Lacy.

"Income, Selected References on the Concept of Income and Methods of Obtaining Income Statistics," U. S. D. A., Washington, D. C., Agr. Ec. Bibliography 73, May 1938.

"The Soybean Industry, A Selected List of References on the Economic Aspects of the Industry in the United States, 1900-1938," U. S. D. A., Washington, D. C., Helen E. Hennefrund, Esther M. Colvin, and Mary G. Lacy.

Why do so many people try to live up to their "yearned" income?

Woman is a riddle that men can't guess, but they'll never "give up."

Foreign and International Agriculture

To supply information on agricultural research in other countries, titles and a few descriptive remarks of principal articles in the two magazines "Die Ernährung der Pflanze," published in Berlin, Germany, and "La Potasse," published in Mulhouse, France, are given here. Due to space limitation, only articles of general fundamental interest are given, although both magazines contain other articles of local interest and abstracts of outstanding articles in other publications.

Die Ernährung der Pflanze, February 1939, Vol. 35, No. 2

PRESENT-DAY IRRIGATION PROBLEMS AND THEIR IMPORTANCE IN GERMAN AGRICULTURE. *By W. Freckmann,* Berlin, Germany.

Increased population and more intense utilization of the soil increase water requirements, according to the author. Consideration is therefore given to the possibilities of irrigation and benefits obtained from it. Overhead and sub-irrigation may be used, the latter sometimes giving better results. In general, irrigation will not produce as good results as natural rainfall, and various possible explanations for this are given. Among these are increased evaporation, changes in temperature and internal soil conditions, and other factors. Good results with irrigating winter small grains are quoted to contradict the common belief that it is not a good practice to irrigate them. Favorable effects of irrigation on potatoes and grasslands also are given. The importance of organic matter and of maintaining its supply in soils to be irrigated is stressed. This requires special consideration, since it is shown that irrigation tends to reduce organic matter in the soil. Irrigating the soil increases its productiveness and thereby the drain on plant nutrients it contains. Data are given showing greatly reduced available phosphoric acid and potash in irrigated soil compared to a soil not irrigated. Consideration must be given to this in fertilizing irrigated soils.

THE IMPORTANCE OF THE "MINOR" ELEMENTS IN PRACTICAL AGRICULTURE. *By M. Trenel,* Berlin, Germany.

In addition to the 10 elements formerly believed to be necessary and sufficient for plant growth, several others have now been shown necessary, especially boron, manganese, copper, zinc, and cobalt. This recognition is the result of widespread pathological disturbances in the normal development of plants, which could be corrected by the use of these elements. The presence of boron in seeds was first reported in 1857, and its beneficial effects on plant growth were observed in 1876, but no particular significance was attached to these facts owing to amounts in the soil being sufficient to supply the needs of the plants. It is noticeable that the original essential elements tend to be grouped in the middle of the periodic table, and the "minor" elements are contiguous to them. Experiences with problems involving the use of "minor" elements are briefly described. Crops on a calcareous, sandy clay marl, high in organic matter, would not grow properly, and forage from the soil fed to animals caused abnormal appetites to develop. Manganese overcame this difficulty. In another area in Germany, copper salts were very beneficial on crop development and on the animals fed the properly fertilized forage. Cases of similar good results with cobalt in Australia and New Zealand are quoted.

THE PRINCIPLES UNDERLYING THE EVALUATION OF AGRICULTURAL SOILS IN GERMANY. *By A. Hock,* München, Germany.

A description of the methods used in mapping the soils of Germany on the basis of the type, origin, water relationships, general condition and local climatic relationships.

THE FERTILIZATION OF COVER CROPS. *By W. Selke,* Lauchstädt, Germany.

This abstract of an article describing work in Saxony shows the necessity of mineral fertilizer in growing cover crops that are removed, if best results are to be obtained on the cover crop as well as the following crop. A mixture of winter vetch, crimson clover, and rye grass was used as the cover crop, and this removed about 35 pounds of phosphoric acid and 130 to 150 pounds of potash per acre. The crop of potatoes following the cover crop responded markedly to fertilization, and the yield of tubers as well as starch content was favorably influenced by potash fertilization.

THE VITAMIN C CONTENT OF VEGETABLES. *By A. Scheunert and J. Reschke,* Leipzig, Germany.

Abstract of article showing that a complete fertilizer apparently had no effect on the vitamin C content of vegetables, compared to no fertilizer.

EXPERIMENTAL WORK ON THE CULTIVATION, RESOWING, BREAKING UP, AND MANURING OF GRASSLAND. *By E. Klapp,* Bonn, Germany.

Potash and phosphate fertilizers increased hay yields about 20%, while complete fertilizer gave an average increase of 45-50%. The former in general increased the clover, while the nitrogen increased the grasses. Scarifying the sod usually had a deleterious effect, especially on the clovers. Fertilization is easier and more effective.

La Potasse, January 1939, Vol. 13, No. 117

WHAT SHOULD BE DONE AFTER THE DECEMBER FREEZES? *By L. Audidier,* France.

The author first warns against a too hasty judgment on the necessity of reseeding, following the severe weather in December which apparently greatly damaged winter grains in France. Good stooling wheat varieties need only 60 to 65 plants per square yard for a satisfactory yield. If reseeding is necessary, it should be done as soon as possible, with appropriate varieties. Since the reseeded wheat has a much shorter growing period, it must be well-fertilized to enable it to make up for lost time. A fertilization to provide 15 pounds of nitrogen per acre, 20 pounds phosphoric acid, and 40 pounds of potash is recommended. If no fertilizer was applied for the fall seeding, double these amounts should be used. The soil should be rolled, preferably with oxen or cows, as they walk more slowly than horses, with possibly a light harrowing after danger of further frost is past.

FINLAND, A LAND OF WATER. *By J. F. de Ferrière,* Mulhouse, France.

A brief description of the soils of Finland, their origin, nature, fertilization, and management.

RECONFIRMATION OF THE NECESSITY OF BALANCING FERTILIZERS. *By H. Richard,* France.

Potatoes growing on a loamy soil low in phosphoric acid and neutral were fertilized with nitrogen, phosphoric acid, and potash alone and in all possible combinations, with double amounts of the nutrients in complete fertilizer also added, and unfertilized areas serving as checks. The data show that the potash plot was the only one of the singly fertilized to yield more than the unfertilized. In the two element treatments, again only those containing potash in the combination yielded more than the check. Largest

yields were obtained on the completely fertilized areas. Doubling the potash in the complete fertilizer increased the yield only slightly, but doubling both the nitrogen and potash increased the yield markedly. Doubling all three of the elements gave a further small increase, but not enough to be profitable, according to the author. The single treatments corresponded approximately to 100 pounds per acre each of nitrogen and phosphoric acid, and 200 pounds of potash. The highest yield, produced by the double increment of complete fertilizer, was almost 500 bushels per acre, while the lowest yield, produced by nitrogen and phosphoric acid, was about 100 bushels.

Borax for Alfalfa in Northern Idaho

(*From page* 11)

were used because they are vigorous growers, are easy to handle in the greenhouse, and if suffering from a lack of boron, exhibit definite symptoms which are easy to recognize.

Figure 2 shows five plants that show the characteristic symptoms. Note how the center of each plant appears dead and how the older top leaves droop. As a rule, the base of the young leaves became yellow first, and this is followed by death of the terminal buds in severe cases. These symptoms make it easy to detect a soil that has an insufficient supply of available boron, and the method proved to be useful as a supplement to the field tests.

It was noted that the symptoms were produced sooner on those plants growing in the second-foot soil samples, indicating that there was less available boron to begin with in the subsoil. This fact is brought out by figure 3, which shows plants growing in both the first- and second-foot samples of the same soil. Note also the vigorous growth obtained in the soils at the left, which received boric acid at a rate equivalent to about 45 pounds of borax per acre.

It has been noted by farmers that the second cutting of alfalfa is more seriously affected by the type of yellowing described than is the first. These observations were confirmed by

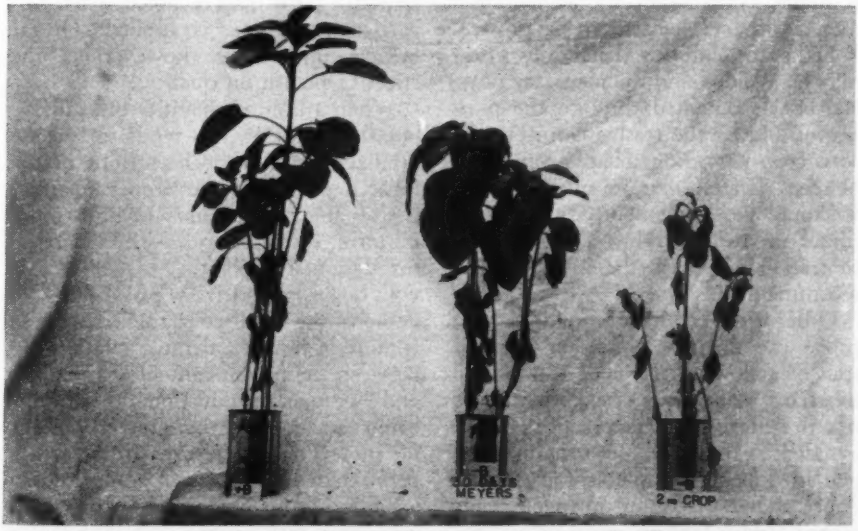


Fig. 4—Sunflowers growing in a first foot sample of a gravelly loam soil. The treatments are, from left to right: Boric acid added at a rate to supply the equivalent 45 pounds borax per acre; no boron added; and the second crop produced by this pound of soil without boron additions for either crop.

producing a second crop of sunflowers in the same soil which had already produced one crop. It is seen in figure 4 that these second-crop plants do actually make a smaller growth in the greenhouse. This shows that the first crop had evidently removed most of the available boron, leaving less for those plants of the second crop.

As a result of these greenhouse investigations and field trials with borax, it is concluded that many of the soils in northern Idaho are deficient in boron for alfalfa, and that substantial increases in yields can be obtained by the addition of borax either in the spring or in the fall, preferably at the latter time.

Problems of Feeding Cigarleaf Tobacco

(*From page* 8)

including nitrogen, in readily available forms. At the same time there is the further possibility that certain organic compounds may have a direct beneficial effect on the growth of the plants.

Other growers have resorted to applications of fresh manure to accomplish the same purpose. This practice is not to be recommended.

While fresh manure contains some nitrogen in a rather available form, a far larger quantity is present in unavailable form. Manure must undergo decomposition before the greater quantity of nitrogen is made available. As in the case of cottonseed meal, there is the possibility that more nitrogen is made available in the later rather than in the earlier stages of growth. Whether or not this deleterious effect may be avoided and the necessary physical effects obtained through the practice of adding the fresh manure to the corn crop preceding tobacco remain to be seen. If fresh manure must be used, it should be supplemented with a fertilizer mixture carrying a higher concentration of potash than is ordinarily recommended.

Other growers have sought to improve the physical condition of their soils by following clover or alfalfa with tobacco. Many years of experience lead one to believe that this practice is to be avoided, as these residues contain nitrogen in difficultly available forms. Evidence shows that more nitrogen is absorbed from legume residues in the later stages of growth. Moreover, some results have been obtained which showed more than 5% of nitrogen in the mature leaf, without any further nitrogen addition. Furthermore, the potash content of these leaves is usually at a very low level.

From what has been said it is evident that a considerable amount of attention should be given to the quantity and kind of nitrogen fertilizers to use for cigarleaf tobacco. It is apparent that organic carriers of nitrogen should be reduced to a minimum.

Many soils in Lancaster County are decidedly low in available potash, as indicated by characteristic symptoms of potash deficiency during the growing season. In these cases a marked increase in yield may be noted when this particular fertilizer is applied. Of far greater importance, however, is the effect of potash on quality.

When a limited quantity of available potash is present, this tends to become localized in the upper portions of the tobacco plant. If the proper quantity is available, there tends to be a more uniform distribution of this material throughout the plant.

It is a comparatively easy matter to demonstrate to all concerned that there is more or less of a definite relationship between the potash content of the plant and "wrapper" production, other things being equal. As the grower obtains far more financial returns from "wrappers" than from a lesser grade known as "fillers," this becomes a factor which he cannot well ignore.

It is a matter of common knowledge that a high potash content in the leaves

reduces transpiration and therefore results in a better economy of the moisture supply. This is in part due to the formation of "cutin" which is found on the surface of the leaves, a factor of great importance during a drouth, as it interferes with the passage of moisture from the leaf to the atmosphere.

No element plays a greater role in the burning quality of tobacco than does potassium. Moreover, this element, in combination with malic and citric acids, appears to furnish a considerable amount of the energy necessary for the bacteria normal to the fermentation process.

The maximum benefits of a potash application are governed to a considerable extent by a number of environmental factors. The soil should be slightly acid, should contain a minimum of nitrogen organically combined, and should be properly balanced with respect to the other necessary fertilizer ingredients.

It is evident that the fertilizer treatment for a given soil should vary to some extent in a given locality. Excellent results have been noted throughout the County where a 4-8-12, 3-8-12, 3-12-12, 3-8-16 or 3-5-12 mixture has been used. It is quite evident, however, that it is not economical for a fertilizer manufacturer to place on the market a wide variety of tobacco fertilizers. At the present time, it is believed that either a 4-8-12 or a 3-8-12 mixture will meet the average conditions prevailing in this locality, on soil following corn, to which well-rotted manure has been applied in ample quantities and the fertilizer applied at the rate of 1,000 lbs. per acre. The cost of such an application is well within the reach of the average grower from a financial standpoint.

If these recommendations are followed out, other things being equal, a maximum concentration of potash is obtained in the leaves and a somewhat lower nitrogen content will prevail, a condition which favors quality and yield. At the same time the plants are far less susceptible to certain bacterial diseases which are common to the tobacco crop.

The Importance of Potash

(*From page* 19)

South Carolina over a period of 6 years. All plats in the experiments received the equivalent of 600 pounds per acre of a 5-10-0 fertilizer, and received the equivalent of 15 pounds of nitrogen as a side-dressing at chopping time. The mixed fertilizer contained dolomitic limestone in amounts sufficient to supply 200 pounds per acre. The potash was applied at the time and in the amounts indicated. The yields of seed cotton given in this table are the average of 56 separate plats for each treatment; the averages for each rate and the percentage increases are from 168 individual plats.

It is to be noted that the yield of seed cotton averaged 743 pounds per acre without the addition of potash. The yield of seed cotton on the same soils was stepped up to 1,379 pounds upon the application of 75 pounds of K_2O (150 pounds of 50 per cent muriate of potash); this is an increase of 81.5 per cent. Corresponding increases are noted for all rates of potash applied.

These results indicate very little difference in the time of application for potash, that is, all potash applied under the crop, split-application half under and half to the side, or all to the side. If there is any advantage, it would fall to the time when all the potash is applied under the crop or the split-application. Some of the plats that received no potash at planting time showed potash hunger by chopping time. The side-dressing of potash at that time helped correct this condition, although it was thought some damage to the

TABLE III—SIX-YEAR AVERAGE YIELD IN POUNDS OF SEED COTTON PER ACRE FROM EXPERIMENTS ON RATE AND TIME OF APPLYING POTASH TO COTTON

Pounds of potash applied	Time of application	Average	Average for each rate	Increase over no potash		Increase of seed cotton for each lb. of potash
				lb.	per cent	
None		743	743	.....	.....	.....
15	All before planting	970				
	½ before planting, ½ at chopping	957	981	238	32.0	15.9
	All at chopping	1,017				
30	All before planting (24 checks)	1,234				
	All before planting	1,128				
	½ before planting, ½ at chopping	1,099	1,126	383	51.5	12.8
	All at chopping	1,045				
45	All before planting	1,214				
	½ before planting, ½ at chopping	1,209	1,186	443	59.6	9.8
	All at chopping	1,136				
60	All before planting	1,291				
	½ before planting, ½ at chopping	1,292	1,283	540	72.7	9.0
	All at chopping	1,266				
75	All before planting	1,359				
	½ before planting, ½ at chopping	1,379	1,349	606	81.5	8.1
	All at chopping	1,310				

final yield had already taken place.

From the results given in table III it becomes apparent at least that a good many fields or areas in South Carolina give a profitable response to potash in addition to that applied in the average commercial fertilizer.

True, not all soils give response to high applications of potassium. The same soil under different farm conditions gives different responses. Most of the experiments reported in this table were conducted on fields admittedly subject to cotton rust by the farmer.

Results from the experiments indicate that the fields on which these tests were conducted showed marked response from all rates of potash applied (15 to 75 pounds per acre). The interpretation of these results will be a valuable guide in recommending fertilizers for their respective communities.

Use Good Soil for Hybrid Corn

(*From page* 17)

which enabled the hybrids to make greater use of the plant food in the more fertile soil.

Chemical data on the nutrient composition of hybrid corn are not sufficient at the present time and particularly in relation to soil productivity to say whether or not in their greater production they take up more plant food, or use what they take up more efficiently than open-pollinated varieties. From

the evidence available it would seem that there is not much difference in composition of the grain, bushel for bushel, between open-pollinated corn and widely adapted hybrids.

The danger to soil productivity lies in the hybrid's capacity to produce more bushels per acre on the naturally fertile corn-belt soils. If corn producers take advantage of the superiority of hybrids on good soil without recognizing the dangers involved from a more rapid depletion of available plant food, their soil will not be in condition to express hybrid superiority for long. On the other hand, if hybrid superiority on good soil is used to stimulate more and better soil enrichment practices, then there is an opportunity to go even beyond what has already been accomplished.

Thus far two ideas have been advanced, first, potassium is fast becoming an important factor in corn growing on Illinois soils and, second, the genetic constitution of the plant has had an important bearing on fertility problems in some of which potassium plays an important part. Conditions like those created at Dixon exist on many of the Illinois soil experiment fields. Recent studies with hybrid corn on these fields emphasize the influence that genetic factors may have on nutritional problems.

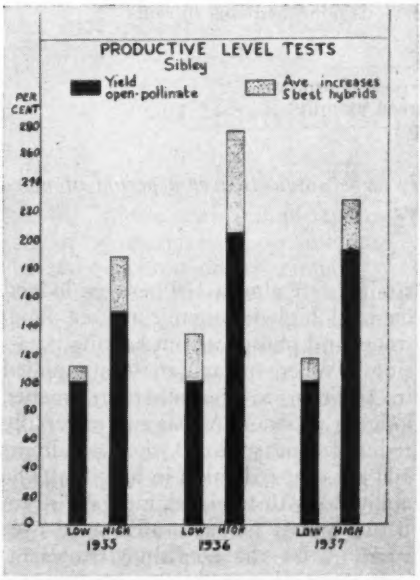


Chart 1—Yields of open-pollinated corn on two soils widely different in productivity are represented in percentage by the solid black bars. The low level yields were used as 100 per cent each year and were 47, 29, and 49 bushels an acre respectively for the 3 years 1935, 1936, 1937. The shaded portion above the solid bars is the percentage increase of the five best hybrids over the open-pollinated variety. As an average for the 3-year period, the difference between the productive level of the two soils was 27 per cent greater if measured by hybrids instead of by open-pollinated corn.

Germ Plasm and Plant Food

High yield is the resultant of many related and well-known factors. However, in this role the relation that superior germ plasm within the plant bears to the effective use of plant-food material has probably not been given sufficient notice. Superior germ plasm in the plant may make the difference between profitableness and unprofitableness of a soil management practice. Numerous comparisons of hybrids with open-pollinated varieties on the outlying experiment fields of the Illinois Agricultural Experiment Station are of interest in this respect.

At Joliet in 1935 an open-pollinated variety of corn was compared with a top-cross of the same variety on untreated land and on land where sweet clover, residues, limestone, phosphate, and potassium had been used to improve the fertility of the soil. The inbred line with which the variety was crossed introduced factors which produced more uniformity of ears and less barren stalks per unit area. Both factors had a bearing on the results. Yields and photographs of aliquot samples illustrating some of the physical characteristics are given in fig. 1.

Quality and lodging in corn are two additional highly important factors closely related to plant nutrition. Both of these factors may be influenced by the germ plasm of the plant in such a way as to affect directly the results secured from certain soil treatment practices. This is illustrated in figs. 2 and 3 which are photographs taken in the studies made on the Dixon soil experiment field in 1936.

TABLE 2—DIFFERENCE IN RESPONSE BETWEEN HYBRID AND OPEN-POLLINATED CORN ON SOIL EXPERIMENT FIELDS

Field	Soil group	No. of trials	Untreated open-pol. yields	Hybrid increases over open-pollinated				
				O	R	RL	RLP	RLPK
		yrs.	*bu.*	*bu.*	*bu.*	*bu.*	*bu.*	*bu.*
Carlinville	V	4	47	3	3	5	9	11
Dixon	IV	2	63	4	9	6	6	14
Enfield	X	2	26	−3	0	2	8	16
Joliet	VI	5	41	6	8	1	3	10
Kewanee	III	6	66	11	14	12	8	15
Mt. Morris	IV	3	39	4	14	11	15	22
Average			47	4	8	6	8	15
Hartsburg	II	5	47	8	9	9	7	5

Soil Classification

Group II —Dark soils with heavy noncalcareous subsoils
Group III—Dark soils with noncalcareous subsoils
Group IV—Dark soils with open noncalcareous subsoils
Group V —Dark soils with impervious noncalcareous subsoils
Group VI—Dark soils with heavy impervious calcareous subsoils
Group X —Yellowish gray soils with impervious noncalcareous subsoils

Soil Treatments

O = none; M = manure; L = limestone; P = rock phosphate
R = residues (cornstalks and sweet clover green manure)
K = muriate of potash applied for each crop

All materials have been used in relatively large amounts over a period of more than 20 years on each of their respective areas.

At Dixon in 1936 two equally high yielding hybrids were compared on a soil well supplied with limestone, organic matter, phosphate, and potassium. One hybrid was susceptible to ear rots, stalk rots, and root rots. The other hybrid was resistant to those diseases. The resistant hybrid yielded 81 bushels an acre with 68 per cent of the ears of desirable type and quality. The susceptible strain yielded 85 bushels of corn an acre but had only 20 per cent of the ears by weight of desirable quality.

In another test on the same field lodging likewise was similarly affected. Potassium, usually thought to reduce lodging of plants, could not overcome the excess lodging caused by root rot damage of the susceptible strain. Both strains were almost 100 per cent lodged on land high in organic matter, limestone, and phosphate but lacking potassium. Where potassium was supplied in addition to the other treatments, lodging of strain A was not materially reduced, but strain B showed almost 100 per cent reduction in lodging. The ability to withstand lodging gave strain B a 7-bushel per acre advantage over strain A for the potassium treatment.

Barrenness of stalks is a common occurrence in corn and is found in most open-pollinated varieties grown in Illinois. This undesirable character is most common during dry seasons and on good soils where a thick stand has been secured.

Barrenness reduces the chances for obtaining higher yields by thick plant-

ing. Thick planting is a desirable practice on highly fertile soils. Fear of stalk barrenness hinders the use of some desirable fertilizer practices and actual barrenness may reduce the returns from desirable fertilizer practices. Some of the better hybrids seem to have the ability to produce an ear on each stalk even under very adverse conditions of weather and competition. Such a characteristic is highly desirable because it eliminates to a large extent the danger of yield reduction which in the past has too often occurred when thick planting and phosphate fertilization were attempted in seasons which turned out to be very dry.

All of the factors mentioned, and many more, have a bearing on the future management of corn-belt soils. Results in table 2 from the outlying soil experiment fields in Illinois illustrate how hybrids which combine many desirable characteristics in their germ plasm have performed in comparison with standard well-adapted open-pollinated varieties of corn.

The relation of the soil's natural productivity to hybrid superiority over open-pollinated corn is shown by comparing the 11-bushel increase on the untreated plot at Kewanee with the decrease of 3 bushels on the Enfield plot. These two fields represent the extremes in natural productivity. Increases for hybrids over the open-pollinated corn on the variously treated area correspond very closely to the effectiveness of the various treatments on the particular soil. For example, the soil on the Hartsburg field has not shown much crop response for supplementary practices. The other fields in the test have shown good response to some or to all of the treatments. Superior germ plasm in the corn plants, as produced by hybridization, has joined with good soil management practices to make the latter more desirable and profitable than they would have been otherwise.

Grandfather Rothamsted

(*From page* 22)

need for it, for with complete fertilizers or with sulphate of ammonia, lime gives a pronounced stimulus to yield, whereas with manure, with unbalanced mineral treatments, or with nitrate of soda, it has no effect or serves to depress the yield.

All of this information argues for care in liming, to lime where necessary with due regard for soil acidity and for the effect that the fertilizers or manures themselves are likely to have on soil reaction over a period of years.

I could have spent hours on the "Park" looking at the various treatments and studying the guide book as well as talking with the genial guide. But time, when you travel, is precious, so we walked through the woods to Broadbalk field which in reality carries the oldest experiment in the world.

Wheat has been grown on Broadbalk continuously since 1843, the first field trial laid out at Rothamsted. The soil and climate are well-suited to the fibrous-rooted grass crops like wheat and hay, and good yields of wheat are produced not only at Rothamsted but all through England. An average annual yield of 34 bushels per acre has been maintained on the manured plot, and the complete mineral plot has produced 35 bushels annually through the years, compared to 12 bushels for the unfertilized area.

Yields do not mean so much, however, as the implications of and the conclusions that may be drawn from the experiment. Wheat has, of course, proved to be a good crop to use for continuous culture. Complete fertilizers and farm manure, too, have proved very effective in sustaining yields, and the data show the futility of an unbalanced scheme of fertilization.

The wheat crop is quite dependent upon nitrogen, and yields rise steadily with increasing equal increments of this substance up to 86 pounds of elemental nitrogen per acre and are further increased when more is applied.

Since 1925 one-fifth of this old field has been fallowed each year because, among other reasons, it was found difficult to keep the weeds out of wheat grown year after year on the same land, and plot yields are now recorded by fifths of plots for this reason. After fallowing, the yield of wheat jumps tremendously, and yields of more than 50 or 60 bushels per acre have been estimated from some of the treatments after the year of fallow. This of course suggests that a rotation of crops is better than continuous cropping, and probably explains the tremendous stimulus which nitrogen gives to the crop on this field, since fallowing permits of an accumulation of nitrogen in the soil.

System of Drainage

One of the most interesting things about Broadbalk is the system of drains, one under each plot, which empty into a walled ditch, thus permitting the collection of the drainage water. From the study of the water from these drains has come a good deal of our common knowledge concerning the leaching of plant-food elements from the soil and the relation that exists between fertilizer applications and the amounts of plant food leached out in drainage water.

Another test almost as interesting as Broadbalk is that on "Barnfield," which with the exception of 3 years has grown root crops continuously since 1843. Starting with 1876, mangolds have been grown there each year.

The best crops have been grown on a combination of manure and chemical fertilizers. Mangolds appear to need abundant nitrogen. Nitrate of soda is the best carrier, and the crop is quite dependent upon potash if manure is not used or if sulphate of ammonia has been applied as a nitrogen carrier. Salts of sodium appear to give some response in mangolds, which fact may make nitrate of soda more effective as a carrier of the element nitrogen.

Deficiency Symptoms

Agdell is a rotation field, having been in a 4-course rotation since 1848. A clover rotation has maintained as good or better yields than one in which there is a year of fallow (the old system), and has given a crop of clover in addition. It has been demonstrated on Agdell that some crops do quite well on starved land, while others fail completely.

Likewise Hoosfield, on which barley has been grown since 1852, has its important lessons, such as the value of phosphorus in promoting maturity and the dependence of barley, like wheat, on a generous nitrogen supply. All of these fields afford ample opportunity for studies of nutrient deficiency symptoms caused by the various important elements, depending upon the fertilizer system in vogue on the plots in question.

I could have stood a good deal more of the sightseeing on these old plots, but the guide informed us that it was tea time, and that tea was served daily on the grounds. As the guide was English, I did not have the courage to suggest that we miss tea just because there were more things to see, so we hastened back to the station grounds for this event.

Afternoon tea is the custom at Rothamsted. It affords an interlude so that the workers may chat with each other, and it gives visitors an opportunity to meet socially the various members of the staff. This I was glad to do, and I took advantage of the opportunity to talk further with two or three members of the staff about mutual problems, one of which was the use of rapid soil tests that have become quite popular in this country. Due to the long history of crop production capacities of most of the soil types in England and to the fewer soils, as well as the longer records that are available on the effects of fertilization, these

rapid chemical tests have not been found to be so necessary in Great Britain as with us. Workers are, however, testing them and weighing the different methods in vogue here, but so far they haven't been used to any extent.

I was reluctant to leave Rothamsted. It is not only the oldest experimental station in the world, but it was here that superphosphate was first demonstrated to be superior to ground bone or ground rock that had not been acidulated. Here, too, was first proved the efficiency of nitrogen as a fertilizer either as nitrate or ammonia salts. There is so much history bound up in the place and so much of the work that has been done is fundamental to other similar work the world over that one cannot escape the significance of it or neglect to admire the keen foresight of its founders and the capable management and direction it has had all through the past century.

I would like to spend a summer there, working in the various plots, studying the crops and soils and the harvests that are taken from them and absorbing some of the enthusiasm of the workers. But that is probably asking too much. I shall have to be content for the time at least with the things I saw and with the brief visits it was my pleasure to have with the staff . . . and with studying the printed records that are sent out from time to time.

But if you go to England, don't miss Rothamsted. You will find a kindly and hospitable welcome that you will always remember, and you will be able to see for yourself these old fields which mean so much to modern agricultural research and which justly give rise to the title, "Grandfather Rothamsted."

Research Replenishes Florida's Sugar Bowl

(*From page* 13)

produced, of which 14,606 were planted in the field. From these 1,170 were selected for line tests, and gradually the number found desirable was reduced to less than 100, then to around 12. The patience of research was about to be rewarded. A few of these new strains showed definite and marked superiority.

Dr. Bourne resigned in 1934 to go with the new sugar concern. The Station appointed F. D. Stevens to do agronomic work with sugarcanes, and Thomas Bregger is continuing the breeding work.

Sugarcane is planted in the Everglades from August through the fall. Formerly the harvest season began in December and continued for 4 months, or into April. With the sugar house operating only 4 months, the company could not obtain best use of its labor, and so one of the things it greatly desired was to extend the harvest season. Success of the efforts by plant breeders is evidenced by the fact that the sugar house began its 1938-39 operations on November 1 and expects to continue for about 8 months.

One of the new canes developed by Bourne, simply designated F31-962, can be harvested as early as October 15. Mid-season varieties which will outyield the old ones are available. And canes which will stand in the field until April and still retain a good sugar content also are available now.

Higher yields naturally have been sought, not only in tons of cane per acre but also in pounds of sugar per ton. Here again success has crowned the efforts. In 1929-30 a ton of cane produced only an average of 142 pounds of sugar. F31-962 will produce around 44 tons to the acre and will yield slightly more than 200 pounds of 90-test sugar per ton. Other strains return 180 pounds of sugar, or more, per ton. It requires 107 pounds of 90-test raw sugar to refine into 100 pounds of the table product. Refining of the Clewiston sugar is done in Savannah, Georgia.

The researchers have sought also to build canes which will stand straight and erect and are easily stripped for harvest.

Sugarcane grows tall and lush in the Everglades. This shows the comparative height of mature cane.

The plant breeders also are seeking cold resistance in the new canes, since areas removed from Lake Okeechobee sometimes get killing frosts which necessitate rapid harvest of damaged cane. More susceptible varieties are planted near the lake, resistant ones away from it.

Fertilizer problems confronting the growers of sugarcane, as well as vegetable crops, in the Everglades have been of such nature as to test the ingenuity and imagination of the researchers. The raw sawgrass peat soils, which constitute the great majority of the Everglades area, although apparently containing vast fertility, refused to yield a harvest. Consternation reigned, since the State had spent two decades and millions of dollars in reclaiming the area, only to find the lands unproductive.

Investigators at the newly established Everglades Experiment Station tackled the problem with a vim and soon found that small amounts of copper were needed to induce the raw sawgrass peats to bring forth their harvests. On burned over areas, particularly, and later on other areas, manganese was found to be needed also. Very early work with sugarcane showed responses to this latter element.

The peat soils contain large natural amounts of nitrogen, and smaller amounts of phosphorus and even lower quantities of potash. As the years have passed since reclamation of the Everglades, it has become evident that potash is the first of the "big three" elements to become deficient. This might have been expected, since potash is required in larger amounts by most plants. Striking responses with potash on these organic soils have been obtained in some of the tests, giving both better growth and higher disease resistance with vegetables and other crops.

Phosphorus deficiency develops later, as the peat soils are cropped for several years. It is entirely possible and even probable that a nitrogen deficiency will develop in time also, but it is not known how long this will take to become evident.

Must Control Pests

And another point where experimentation and accurate records have aided has been in rodent control. Rats infested the muck lands and would gnaw the canes near the base until the stalks fell to the ground and were lost to sugar operations. Agronomist Stevens made some careful checks and found that rats, rabbits, coons, and other rodents were causing losses ranging from 15 to 36 per cent of the crop. The Clewiston corporation appropriated $20,000 for rodent control, and now the pests are annually kept from damaging the crop, the company figuring it saves $100,000 each year.

The only other pest giving noticeable trouble seems to be the wireworm, and this is a difficult one to combat. Fortunately, its ravages are not extensively serious.

The corporation with headquarters in Clewiston has 23,000 acres in cane, and harvests around 18,000 acres annually. Another sugar company began operations in Fellsmere in 1930 and has a smaller acreage. During recent months a cooperative group has been organized, with backing from the Clewiston concern, and the organizer states that he has 100 farmers signed and ready to

plant 25,000 acres of cane if and when quota restrictions are lifted to permit.

The muck lands are first drained and then plowed and "moled" or underdrained with a bullet-shaped implement pulled through under the ground working somewhat as would a mole. The cane is then planted and cultivated until it practically covers the space between rows. Stubble in the Everglades will produce for several years, but for one reason or another most of it is plowed up after 6 years. Now that the better canes have been planted, stubble may be left longer, unless still better ones are found.

The cane is harvested by hand, hauled on tractor trains to the nearest loading station on the company's railway. Each tractor pulls six cars each with a load of 4 tons which is mechanically hoisted onto railroad cars. The tractor train just fills the railway car which holds 24 tons.

The corporation owns 75,000 acres of muck lands suitable for sugarcane production. It puts about 5,000 tons of cane through the sugar house in a 24-hour day, just about double the input 10 years ago. Its seasonal output for 1937-38 was about 323,000 325-pound bags of raw sugar, or 52,487.5 tons.

Those conversant with sugar production in the Everglades believe that Florida alone could produce a hefty portion of the nation's sugar requirements—could almost fill every sugar bowl in the United States. Conservative estimators say that there are at least 150,000 acres of muck lands in the Glades ideally suited for sugar production, which would yield around 600,000 tons of sugar annually, while the more optimistic believe that possible acreages and yields are several times those amounts.

The Ides of March

(*From page* 5)

farm, and the county agent had these tested for acidity, and available potash and phosphorus, so that each farmer received his analysis in the winter.

Then by circular and at meetings some cogent facts were set forth. In this particular area records kept on about a thousand farms showed that those with a heavy percentage of crop land in alfalfa realized almost double the labor income received by farms with little or no alfalfa. The majority with about 10 per cent of crop land in alfalfa had $16 crop value per acre, $218 worth of butterfat sales per cow, and $675 labor income. About 60 farms that ran an average of 35 per cent to alfalfa had a crop value per acre of $25, butterfat sales per cow of $255, and over $1,100 labor income.

Well, what shall be done with this alfalfa? Further records indicated that alfalfa furnishes the cheapest feed for cattle, hogs, and sheep that the area can grow. Lower production costs through savings on feed investments attract most provident farmers. Moreover, good pastures are the cheapest and best source of nutrition, but they need some renovating, and some supplementing of native bluegrass with sweet clover or other legumes and grasses. Twenty dollars an acre net return per season has been secured in this area from pork production on alfalfa pasture. Winter feeds of clover and alfalfa hay, free choice or with linseed meal and tankage, are excellent economic feeds for fattening and breeding swine. Similarly, with sheep and to some extent with chickens, benefits from a storage of legume reserves are easily and definitely proven.

By reference to the soil analyses and having familiarity with the topography and yields, reason dictates to anybody that much of the soil in this area has been badly worn and washed, due to continuous cropping, grazing, leaching, and erosion. Acidity is prevalent. Plant food is not well balanced.

Legume culture and suitable rotations to restore fertility and organic matter, strip cropping, terracing and contour farming on sloping fields, and

longer rotations with legume-grass mixtures occupying the land for three or four years out of a six-year cycle—these are some of the imperative salvations. For both the land's sake and the livestock's welfare, with both contributing ultimately to bigger cash crops and a larger bank account, reason will usually dictate more alfalfa or clover.

In the extremely rough erosion areas, men have for years planted tilled crops like corn on washable slopes, or else cut down their acreage to a small valley strip. Restriction of corn to smaller acreages, leaving the hillsides to mixed pasture and hay, means using hybrid corn on the one hand and lime and fertilizer on the other.

BACK again to fundamentals, the farmers sense the fact that lime, well-chosen commercial fertilizers, and inoculated legume crops are the bedrock requirements in their own farm economy. Having scanned the horizon of their own farms and those they know adjoining, and after hearing the records of feed economy, soil improvement, and erosion control, it is time to show how the conservation program fits into the picture.

By studying the soil-building practices recognized in the charts of the AAA, it is plain that scores of suitable methods are available to earn nearly all or a good share of the initial cost of liming, fertilizing, terracing, seeding down, and green manuring. The dairyman will realize that this is his chance to obtain help for a sensible objective, and that more value per acre is obtained by legume seedings than by soil-depleting grain. Naturally, there is some limit to participation, especially by individuals already well on the road to "legume saturation," but this is no great difficulty on sixty per cent of the farms of the northern States.

I have heard critics exclaim that the whole plan is wrong, because we attempt to reward men for doing what they should know enough to do for themselves. Yet for myself I would rather the government bribed a few souls to save their soils, than to rust away our inheritance until all the land was in the hands of the wise and the rich. And that kind of drifting would hurt Mr. Consumer far worse than a soil-saving subsidy.

THE nearer we can bring our national farm policies to the understanding and the vision of the everyday, little operator, the farther we are going to get on the glory road. Not that soil-saving and land-restoring are simple—not that, by any means. But there is something vital and visible to them, something that can be seen in one season, something which gets right under the mortgage and lifts it off. They appeal to a man who has dug into the brown earth with bare knuckles and coaxed life into weak seedlings. They do not smack of the preacher or the pedantic practitioner. They ring true and smell herby and leaf-moldy, redolent of things to do in the month of March.

Gradually policies at headquarters shape themselves toward this more easily understood and more vital objective. It may not be so very spectacular, and maybe not so very new. But neither is agriculture or food consumption new.

And here I leave you once more for another month, to do your best in March maneuverings toward that universal goal, which is to replenish the earth without robbing it, and to make life a little easier for the stewards of the soil.

NOT SO DUMB

Wifey: "Marie, don't you think my husband is a dimwit?"

Marie: "Oui, madame, he ees veree amusing in ze dark!"

"Madam, you'll have to pay full fare for that child. He's over five years old."

"Impertinent! I'll report you! Why, he couldn't be that old! I've only been married four years."

"Never mind the true confessions, lady—pay another fare or get off the train."

"Those poor little boys next door have no Mama or Daddy and no dear Aunt Emma," said a mother to her little son. "Now, wouldn't it be nice to give them something—just a little present?"

"Yes, indeed," he replied, quickly. "Let's give them Aunt Emma."

"My wife kisses me every time I come home. That's affection."

"You're wrong. That's investigation."

A member of the home missionary society approached the meanest man in town. "We are having a raffle for a poor widow," she declared. "Will you buy a ticket?"

"Nope, I couldn't keep her if I won her."

Mrs. Scarponi (standing in swimming pool up to her neck): "My goodness, Tony, where'sa da baby?"

Mr. Scarponi (beside her): "He's all right. I gotta him by da hand."

"Was he surprised when you said you wanted to marry his daughter?"

"I'll say he was. The gun nearly went off in his hand."

Pat, an inveterate drunkard, went to the priest and asked him what to do about it. "I'm afraid I'll have to put you on the pledge," the priest said, "but mind you, if you break the pledge, I'll turn ye into a rat."

It wasn't long, however, before Pat surrendered to Demon Rum, and arrived home drunk. He sat in dazed silence for a while, then he turned to his wife and said: "Maggie, if you see me gittin smaller 'n' smaller, fer Gawd's sake keep yer eye on the cat."

TIMES HAVE CHANGED

The modern girl was listening impatiently to a long lecture from her grandmother, and at last she could stand no more.

"It's all very well to find fault with my new frock, granny!" she exclaimed. "But didn't you ever set your cap at a young man?"

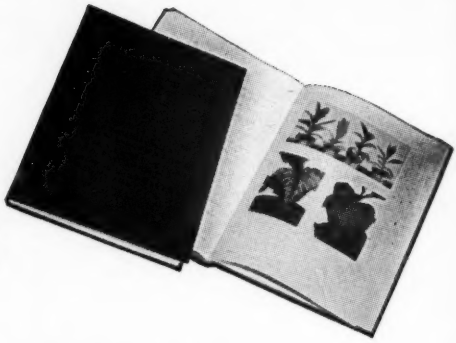
Granny drew herself up. "Never my kneecap, miss!" she retorted.

From Atlanta comes the tale of a colored citizen who won a sizable sum in a lottery. After the pay-off, he invested in some new clothes, went to the Southern Railroad station, slammed down a $100 bill and said, "Gimme a ticket."

"Where to?" asked the ticket agent.

"Anywhere," replied the lucky one. "Don' make no difference. I got business all over."

POTASH DEFICIENCY SYMPTOMS



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